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Northampton County Sustainable Development Initiative

The Feasibility and Economic Potential of Sustainable Development for Northampton County, Virginia

December 14, 1993

Prepared for:
Northampton County Board of Supervisors
Sustainable Development Task Force

by

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Preface

This study was conducted by Resource Analytics, Inc., of Raleigh, North Carolina, under contract to the County of Northampton through its Sustainable Development Initiative. The Initiative is funded by Northampton County, the Virginia Department of Environmental Quality's Coastal Resources Management Program, and the National Ocean and Atmospheric Administration's Office of Ocean and Coastal Resource Management. The SDI effort is aimed at developing an understanding of the links between economic activity and natural resources and to seek ways to maximize economic potential without diminishing the integrity of the ecological base on which this activity occurs and depends. The preservation of the rural character of the county and other time-honored characteristics of the county's culture, are another aspect of this initiative.

Production of this report would not have been possible without the assistance and cooperation of many Northampton County residents. When documenting the economy of any local area, it is best to consult with those who know it best. The authors would like to acknowledge the assistance provided by the members of the SAMP management team, the members of the Sustainable Development Task Force, and the numerous citizens of Northampton County who helped us out in so many ways toward a fuller understanding of Northampton economy.

We would also like to express our thanks to the people who contributed their knowledge and insight to this report including Gene Brothers, John Chazal and Ernie Wade. Finally, thanks to Jill Listowich for searching out hard to find data and interviewing dozens of Northampton residents to gather information on sustainable development activities occurring in the county.

Executive Summary

Setting

Northampton County, part of Virginia's Eastern Shore, is rich in natural and cultural resources. Its chain of seaside barrier islands, a World Biosphere Reserve, is one of the most important ecosystems in the eastern U.S. Its Chesapeake shoreline, characterized by coastal bluffs and dunes, is largely undeveloped. Every year the county plays host to more than 260 migratory bird species as they move along the Atlantic flyway. The county, settled during the early colonial period, is rich in heritage. Dozens of historic structures still dot the landscape.

Northampton's economy is based on farming and, to a lesser extent, fishing. Agricultural productivity has been remarkably steady through the years. Seafood production, however, has declined with the diminution of fish stocks. Vegetable and seafood processing, once a mainstay of the economy, has nearly disappeared, leaving many unemployed and underemployed. This, together with a general lack of economic opportunities for many county residents, leaves the county with one of the highest poverty rates in Virginia.

Opportunities

Northampton County can begin to capitalize on its natural and cultural assets to build and strengthen its economy while preserving and enhancing its resources. Agriculture, seafood, nature-based and heritage tourism, ecological research, and indigenous arts and crafts all offer opportunities for sustainable economic development.

Nature/Heritage Tourism

Nature-based tourism can play a major role in economic development given the quality and variety of natural and heritage resources of the county. Boating and fishing are the most predominant nature-based tourism activities taking place in the county today. However, Northampton can potentially capitalize on its unique wildlife resources and capture a large share of the wildlife observation and birding market in the metropolitan areas of Virginia, Maryland, Washington, D.C., and Pennsylvania.

There were an estimated 70,300 recreation party-trips made by residents and non-residents in 1992 for fishing, boating, sightseeing, observing wildlife, and other travel activities. Lodging unit occupancy averaged below 25% in 1992, with a maximum monthly occupancy rate of 67 percent in July. People engaged in recreation, travel and tourism in the county spent a total of $9.916 million on lodging, restaurants, retail groceries, fuel and oil, and other goods and services. This initial spending generated direct, indirect, and induced economic impacts throughout the county's economy. These impacts are given below:

Total Economic Impacts of Travel and Tourism, 1992 (1990 dollars)

Impact Category	Value ($)
Total Industrial Output	14,297,200
Total Compensation and Property Income	7,808,300
Total Value Added	9,461,900
Employment	454
Contributions to Tax Revenue	51,000
Net Fiscal Benefit	232,000

Travel and tourism is a rapidly growing industry nationally, and it is likely that Northampton County can capture a share of this market if the proper steps are taken.

To understand the potential impacts of an enhanced travel and tourism industry in Northampton County, we developed four tourism growth scenarios. These are:
(1) Doubling the level of boating activities estimated for 1992 while holding other activities constant;
(2) Doubling the level of non-boating activities estimated for 1992 while holding other activities constant;
(3) Increasing the combined yearly motel and inn occupancy rate in the county to 50% and campground occupancy rate to 40%;
(4) Increasing the combined yearly motel and inn occupancy rate in the county to 75%, campground occupancy rate to 40%, and increasing the number of motel and inn units by 25% while maintaining the higher occupancy rate.

Total Economic Impacts of Alternative Travel and Tourism Scenarios, (1990 dollars).

Scenario	Total Industrial Output ($,000)	Total Income ($,000)	Total Value Added ($,000)	Jobs (No.)	Taxes ($,000)	Net Fiscal Benefits ($,000)
1. Double Boating Activity	20,106.6	10,956.1	13,272.7	639	72	326
2. Double Non-Boating Activity	17,213.0	9,395.9	11,399.5	549	62	279
3. Increase Occupancy Rates	21,073.9	11,481.3	13,926.7	673	138	346
4. Add New Lodging Units	28,209.5	15,409.2	18,690.9	899	181	466

Research and Education

The importance of Northampton County and the Eastern Shore for resident and migrating birds has generated much interest among researchers at nearby universities and research institutions. The unique hydrogeology of the Eastern Shore has also generated research activity in the county. In 1992, there were seven research groups active in the county spending over 5,900 research days. Total research expenditures in the county in 1992 was estimated to be approximately $377,500. The total (direct, indirect, and induced) impacts of ecological research in Northampton County in 1992 are described below:

Total Economic Impacts of Ecological Research, 1992 (1990 dollars)

Impact Category	Value ($)
Total Industrial Output	691,200
Total Compensation and Property Income	396,200
Total Value Added	474,400
Employment	25
Contributions to Tax Revenue	2,000
Net Fiscal Benefit	12,000

Old Dominion University, in cooperation with the Nature Conservancy, announced this year its intentions to establish a research facility in Northampton County dedicated to the study of sustainable development. At the time of this writing it was not yet known the size and scope of such a facility, and hence its total affect on the county's economy. If the research facility evolves into a large center sponsored by a consortium of universities and other research concerns, its impact on the community could be substantial. This is especially true if it becomes large enough to employ several people, and provides a large throughput of research days. Much of the impact now felt from research activities in the county is from associated spending by researchers during their stay in the county.

Arts and Crafts

Production and sales of indigenous arts and crafts, often referred to as folk art, can add significantly to a rural economy, particularly if the craftspeople in the area are known for their skills. Although several craftspeople live and ply their trade in Northampton County, there is little in the way of an organized system for production and distribution of arts and crafts on such a scale as to have a significant economic impact. Because of the small and scattered nature of this activity, we did not attempt to model the impacts of folk art production on the economy.

To understand how a strong and thriving crafts "industry" might affect the county's economy, we investigated successful arts and crafts guilds and cooperatives in other communities to learn what they were doing. One such cooperative, the Watermark Association of Artisans based in North Carolina served as our model.

The contribution of an expanded arts and crafts sector to the economy of Northampton County is summarized below:

Total Economic Impacts of an Expanded Arts and Crafts Industry (1990 dollars)

Impact Category	Value ($)
Total Industrial Output	939,900
Total Compensation and Property Income	435,700
Total Value Added	476,400
Employment (full-time equivalents)	19
Contributions to Tax Revenue	2,000
Net Fiscal Benefit	14,000

Agriculture

Agriculture has throughout the county's long history been a mainstay of the economy, even as agriculture in general has declined around in the state and country as a whole. The amount of cropland harvested in Northampton County has remained between about 36,000 acres and 50,000 acres throughout most of this century. Northampton is one of Virginia's largest producers of commercial vegetables, even though the trend has been to diversify into small grains soybeans, and nursery production.

Agriculture is by far the largest component of the county's economy. With total output exceeding $68 million in 1990, this sector drives the rest of the local economy. The total impacts of agriculture in Northampton County are described below:

Total Economic Impacts of Agriculture, 1990.

Impact Category	Value ($)
Total Industrial Output	68,311,200
Total Compensation and Property Income	13,941,200
Total Value Added	15,979,000
Employment (full-time equivalents)	899
Contributions to Tax Revenue	218,000
Net Fiscal Benefit	411,000

To estimate the potential impacts of agriculture on Northampton's economy, we identified five scenarios where producers switched to low-input, sustainable agricultural practices to produce their usual mix of crops. We then measured the potential economic impact of each scenario on Northampton County. The scenarios are described below:

Scenario 1: 40% Loading Reduction Scenario. This scenario assumes a 40 percent reduction in chemical percolation to groundwater from existing practices.
Scenario 2: Conservation Reserve Program (CRP) Scenario. The CRP is a federal program designed to reduce soil erosion through retirement of highly erodible soils from cropping. Federal payments in the amount of $70 per acre are made to the farmer to retire his land.
Scenario 3: Buffer Strip Scenario. Require that 100 feet on each side of a perennial stream be taken out of cropland production. No financial payments were assumed to be made to the farmer in lieu of production.
Scenario 4: Green Manure Crops. Green manure crops added as winter cover are beneficial for preventing soil loss and absorbing residual chemicals over the winter season. This scenario assumed that a clover/rye mix was used as a winter crop and as a green manure source.
Scenario 5: Chicken Litter. In this scenario, chicken litter is substituted for inorganic nitrogen.

The effects of these sustainable agriculture scenarios on the county's economy are summarized below:

Total Economic Impacts of Alternative Sustainable Agricultural Practice Scenarios, 1990.

Scenario	Total Industrial Output ($,000)	Total Income ($,000)	Total Value Added ($,000)	Jobs (No.)	Taxes ($,000)	Net Fiscal Benefits ($,000)
1. 40% Loading Reduction	68,390,400	14,026,200	16,069,900	922	220,000	411,000
2. CRP	67,200,900	13,338,200	15,285,300	866	216,000	319,000
3. Buffer Strips	68,234,700	13,928,300	15,959,600	896	---	---
4. Green Manure Crops	68,777,600	14,417,100	16,494,100	910	218,000	427,000
5. Chicken Litter	68,403,700	14,034,100	16,080,100	901	---	---

Food Processing

Food processing is closely tied to agriculture and seafood production in Northampton County. Changes in activity in this sector have been found to strongly effect output in the seafood and agricultural sectors. Food processing plants were major employers in the county through 1988. However, by 1992, employment dropped from 846 jobs to 202. Vegetable and seafood processing still had a significant impact on the county's economy as late as 1990. The total (direct, indirect, and induced) impacts of food processing on Northampton's economy in 1990 were:

Total Economic Impacts of Vegetable and Seafood Processing, 1990

Impact Category	Value ($)
Total Industrial Output	45,787,600
Total Compensation and Property Income	9,549,000
Total Value Added	10,706,00
Employment (full-time equivalents)	617
Contributions to Tax Revenue	92,000
Net Fiscal Benefit	276,000

The total potential impacts of regaining 1988 levels of food processing capacity on Northampton's economy (in 1990 dollars) are relatively large. About four times the income would be made in the county under this scenario than what was made in 1990. These impacts are summarized as follows:

Total Economic Impacts of Vegetable and Seafood Processing, 1990

Impact Category	Value ($)
Total Industrial Output	184,320,400
Total Compensation and Property Income	38,440,000
Total Value Added	43,068,000
Employment	2,490
Contributions to Tax Revenue	1,338,000
Net Fiscal Benefit	1,278,000

Seafood

The fishery and related industries on the Eastern Shore of Virginia is second only to agriculture in the area in terms of employment and personal income generated. Throughout its history, Northampton County fishermen have harvested vast quantities of fin and shellfish from the Chesapeake Bay and seaside area of the Eastern Shore peninsula.

In 1990 the direct, indirect and induced affects of the seafood industry in Northampton County produced approximately $20.8 million dollars in income and 478 jobs. The total economic impacts of seafood production sector on the county in 1990 are summarized below:

Total Economic Impacts of Seafood Harvesting and Production, 1990

Impact Category	Value ($)
Total Industrial Output	20,759,700
Total Compensation and Property Income	6,804,100
Total Value Added	7,558,000
Employment	478
Contributions to Tax Revenue	49,000
Net Fiscal Benefit	190,000

The potential impacts of seafood harvesting and production were estimated using a scenario that assumes employment in seafood processing in some other county to increase by 750 more people, the number of employees lost in the food processing sector since 1988. If fishing levels by Northampton-based boatmen increased to meet the demand, the following total economic impacts would be observed:

Total Economic Impacts of Seafood Harvesting and Production, 1990

Impact Category	Value ($)
Total Industrial Output	42,858,200
Total Compensation and Property Income	14,047,000
Total Value Added	4,748,000
Employment	987
Contributions to Tax Revenue	100,000
Net Fiscal Benefit	393,000

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1. INTRODUCTION

Northampton County, Virginia, part of Virginia's Eastern Shore, comprises one of the most important natural ecosystems in the eastern United States. The Eastern Shore's chain of barrier islands, largely owned by the Nature Conservancy, and its seaside system of marshes and bays, has been designated a World Biosphere Reserve by the United Nations in recognition of its great ecological value. The barrier islands and surrounding waters support a great variety of fish and birds.

The Chesapeake shoreline in Northampton County is characterized by coastal bluffs and dunes, creeks and inlets. The southern tip is an extremely important habitat for raptors and songbirds migrating along the eastern flyway. With more than 260 bird species passing through, Virginia's Eastern Shore has the highest concentration of migratory songbirds and shore birds in the eastern U.S.

The county's economy has been driven by agriculture, and to a lesser degree seafood production, since it was settled during colonial times. From early settlement times up through the mid-20th century, the regional demand for agricultural products and the relative abundance of marketable marine life buoyed Northampton's economy. However, in recent years, as fish stocks have ebbed and agricultural processing has become regionalized closer to metropolitan centers, the county has experienced a serious economic decline. Major agricultural and seafood processing plants, as well as many small businesses, have closed, resulting in the loss of hundreds of jobs.

Northampton's citizens have met these economic challenges head on. Understanding that the natural and cultural resources of Eastern Shore form the basis for a sustainable economy, Northampton began a strategic process to improve local economic conditions. Beginning with the development of the Northampton County Comprehensive Plan, citizens have worked together over the last few years to define a desired future for the county and strategies to reach their goals. The goals specified in the Comprehensive Plan are to:

- conserve the county's natural resources;
- preserve the county's rural character;
- pursue economic self-sufficiency for all citizens;
- provide adequate public services for all citizens;
- pursue and establish a diversified economic base by supporting agriculture, seafood production, tourism and industry compatible with the goals and objectives of Northampton County's Comprehensive Plan.

Following the comprehensive plan, in 1992, the Northampton Economic Forum, an independent group of citizen leaders developed *A Blueprint for Economic Growth*. The *Blueprint* further articulates goals and development strategies that preserve and capitalize on the county's natural and cultural heritage.

The Comprehensive Plan and the *Blueprint* call for the development of tourism, agriculture and seafood production as the foundation of the local economy. The development of indigenous arts and crafts products and markets, and educational products regarding the World Biosphere Reserve and compatible community development have also been discussed. Yet, the specific economic value and potential of these industries are not known.

Purpose

The overall objective of this study is to provide the citizens of Northampton County with the information necessary to revitalize the local economy through careful and thoughtful development of the county's natural and cultural resources. This study focuses on three major objectives:

1. document the current economic contributions of sustainable industries;
2. document the potential economic contributions of sustainable industries;
3. document the feasibility for development of the most promising industries.

Through the comprehensive planning process and the economic forum, five broadly defined industries were identified as ones that could be labeled "sustainable." These are namely:

1. **Nature/heritage tourism:** birding; recreational/sports fishing; visits to reserves, parks, and refuges; farm/country inn vacations; canoeing; hiking; bicycling; and hunting.
2. **Fishery production:** finfish and shellfish harvesting; processing; value-added products; aquaculture; and special products.
3. **Sustainable agriculture:** traditional crops, grains, nursery products, and specialty "niche" markets.
4. **Arts and crafts.**
5. **Research and education.**

2. NORTHAMPTON'S ECONOMY

Demographics

Northampton County's demographics say a lot about the economy. Age and sex composition change slowly as births, deaths and migration add to and subtract from the population. Demographic composition determines the makeup of the labor force, the demand for goods and services produced locally, and the demands on local social services. Figure 1 compares the median age of the population of Northampton residents with the median age of populations in nearby counties in Virginia and Maryland. The median age of the residents of Virginia Eastern Shore counties is significantly greater than that of the nearby Virginia counties and Maryland counties on the Shore. The median age of the population of residents in both Northampton and Accomack counties is 37.4. The median age of the Virginia population is 32.9, and in Norfolk it is 27.2 (Table 1).

Table 1. Selected Demographic and Economic Characteristics, Virginia, Northampton County, Eastern Shore, and Nearby Cities, 1990.

Location	Median Age	Percent in Labor Force	Percent Unemployed	Per Capita Income	% Below Poverty Level
Virginia	32.9	68.9	4.5	15,713	10.2
Northampton	37.4	55.2	6.9	10,176	26.6
Accomack	37.4	59.8	6.8	10,506	19.6
Chesapeake	31.3	70.9	4.5	13,817	9.0
Norfolk	27.2	68.8	8.8	11,643	19.3
Va. Beach	28.9	76.8	4.7	15,242	5.9
Portsmouth	31.6	62.0	7.8	11,158	17.7
Dorchester, MD	36.9	63.8	5.9	12,437	14.2
Somerset, MD	33.7	51.1	8.4	10,232	16.0
Wicomico, MD	33.2	67.6	4.7	13,425	11.6
Worcester, MD	37.4	64.8	4.8	14,341	11.0

Source: U.S. Dept. of Commerce, 1990 Census of Population and Housing.

A high median age is usually indicative of a problem common to many rural areas. Young people with the best education and health and the most marketable skill and abilities leave the area to realize their earning potential. With them go some of the area's future leaders, innovators, and entrepreneurs. Taxes collected in the county, to invest in the education of the county's youth, are now earning dividends for people and economies in other counties and states.

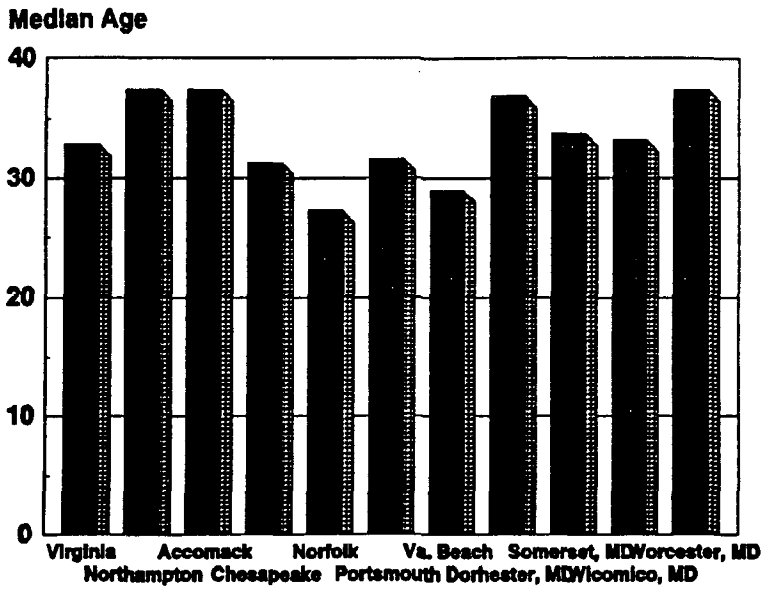

Figure 1. Median Age, Virginia, Northampton County, Eastern Shore, and Nearby Cities, 1990.

Labor Force

The size of the labor force relative to the total population are indicators of the size and strength of a local economy. A large labor force with a high degree of participation is usually correlated with a strong economy. The labor force is defined as the population of individuals at least 16 years old who are willing and able to work. Persons not participating in the labor force can be out of work or otherwise occupied, such as in school. Figure 2 shows participation in the labor force for Virginia, Northampton County, other eastern shore counties, and nearby cities. Among the cities and counties compared, Northampton County's is the smallest labor force with 10,095 persons 16 years old and above. Just more than half (55.2%) of those were in the labor force in 1990. Only Somerset County, Maryland, an Eastern Shore bayside community, has a lower labor force participation rate.

Unemployment in Northampton County in 1990 was moderately high in comparison to neighboring counties and cities (Figure 3). This figure has fluctuated up and down since the time that the census was taken, particularly after the food processing plant closings in 1990 and 1991.

Income and Poverty

Per capita income is a meaningful measure of economic strength and can be used for comparing economies among geographically similar areas. Northampton ranked lowest in 1990 of all the geographical areas compared, with a per capita income of $10,176 (Figure 4). The average per capita income for the state was $15,713 in 1990. Although Northampton's income rate is lowest among those compared, it is comparable to other eastern shore communities in Virginia and Maryland.

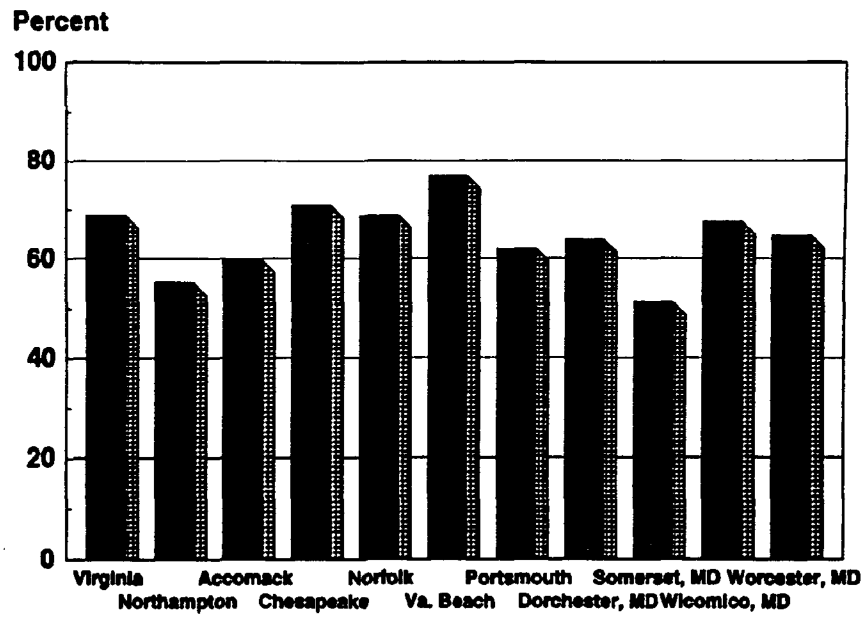

Figure 2. Percent Persons 16 Years Old and Older Participating in the Labor Force, Virginia, Northampton County, Eastern Shore, and Nearby Cities, 1990.

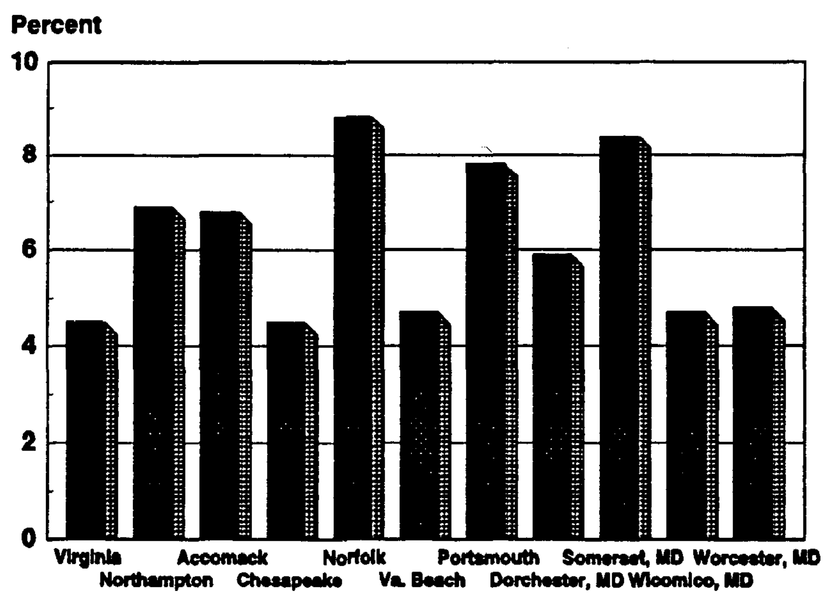

Figure 3. Percent Unemployment, Virginia, Northampton County, Eastern Shore, and Nearby Cities, 1990.

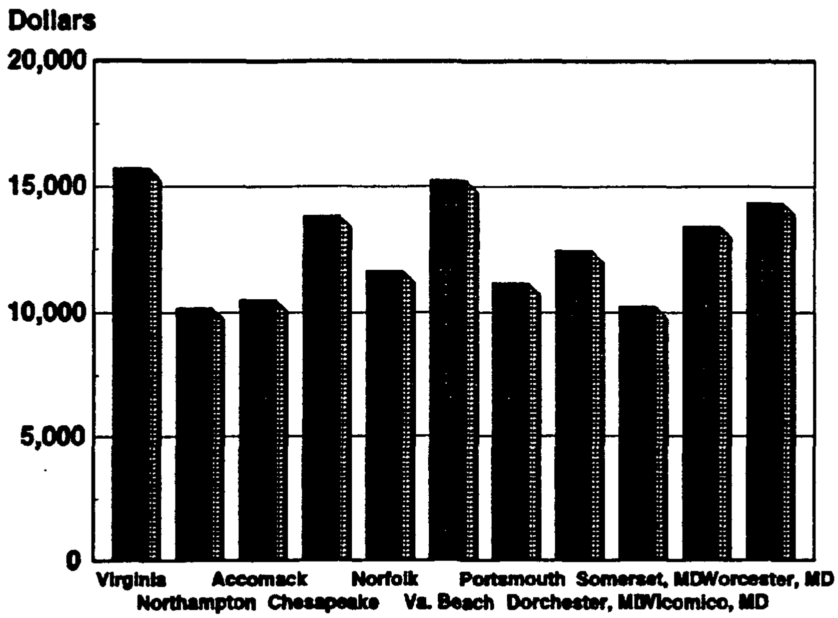

Figure 4. Per Capita Income, Virginia, Northampton County, Eastern Shore, and Nearby Cities, 1990.

Poverty in Northampton County, measured by the proportion of families with incomes below the poverty level, is a serious issue. Over 26 percent of all households in the county are impoverished compared with 10.2 percent for the state and 19.6 percent in Accomack County (Figure 5). The seeming inconsistency between a moderate unemployment rate, a per capita income rate that is not significantly lower than others in the area, and a very high poverty rate can explained by examining income distribution in the county. Roughly 42% of households had 1989 incomes below $15,000 (Table 2).

Table 2. Household Income, Northampton County, VA, 1989.

Income Range	Households	Proportions
<5,000	726	14%
5,000 - 9,999	782	15%
10,000 - 14,999	657	13%
15,000 - 24,999	1042	20%
25,000 - 34,999	722	14%
35,000 - 49,999	569	11%
50,000 - 74,000	364	7%
74,000 - 99,999	98	2%
100,000 or more	128	3%
Total	5,088	100%

Source: U.S. Dept. of Commerce, 1990 Census of Population and Housing.

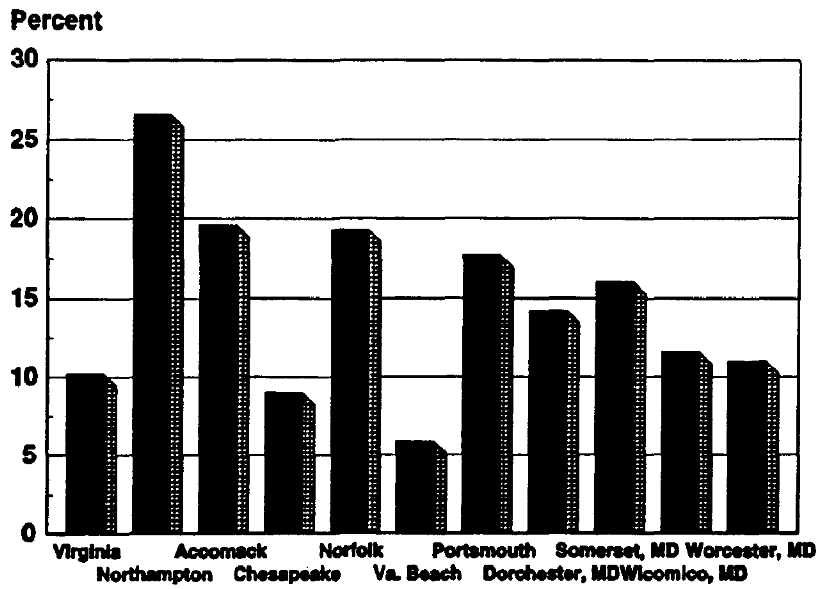

Figure 5. Percent of Households Below Poverty Level, Virginia, Northampton County, Eastern Shore, and Nearby Cities, 1990.

Sectoral Employment and Income

Figure 6 and Table 3 show employment by major industrial sector in Northampton County between 1988 and 1992. The construction, transportation, and financial sectors are quite small employers. Agriculture (which includes fisheries), manufacturing, wholesale and retail trade, services, and government are the largest employers. Manufacturing has declined significantly since 1988, reflecting closings of agricultural and seafood processing plants. Employment in manufacturing dropped from 1,144 in the 3rd quarter 1988 to 783 in the 3rd quarter 1990. Total employment also has dropped by 6% from 4,799 in the 3rd quarter 1988 to 4,519 in the 3rd quarter 1992 with most of that loss coming from the manufacturing sector. Agriculture employment grew during this time.

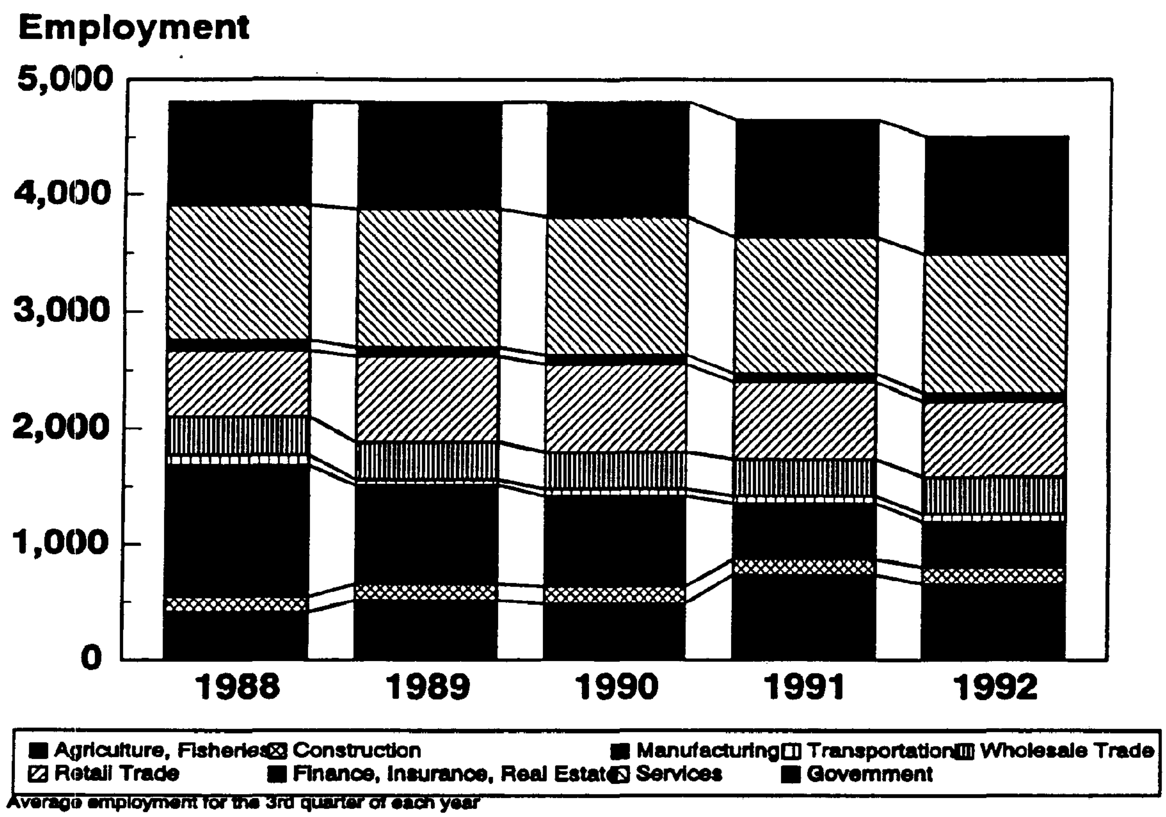

Figure 6. Employment by Sector, Northampton County, VA, 1988 - 1992.

Table 3. Employment by Sector, Northampton County, VA, 1988 - 1990.

Sector	1988	1989	1990	1991	1992
Agriculture, Fisheries	419	514	485	734	656
Construction	127	141	150	132	149
Manufacturing	1,144	858	783	487	392
Transportation	89	52	61	63	62
Wholesale Trade	332	323	321	318	323
Retail Trade	570	738	753	665	654
Finance, Insurance, Real Estate	84	76	82	72	73
Services	1,137	1,182	1,179	1,165	1,184
Government	897	928	1,000	1,019	1,026
Total	4,799	4,812	4,814	4,655	4,519

Source: Virginia Employment Commission, 1993.

In 1988, most wages were earned in the manufacturing, service, and government sectors (Figure 7 and Table 4). In the 3rd-quarter of that year, nearly one-fourth of all wages earned were made in the manufacturing sector, and slightly more in the government sector. By 1992, only 9% of all wages were earned in manufacturing. Also, as the manufacturing sector has declined between 1988 and 1992, so have real wages. Total 3rd-quarter wages paid in Northampton County (in 1992 dollars) dropped from $19,135,024 in 1988 to $17,306,925, a decrease of 11%.

The drop in manufacturing income spurred related drops in real wages in the wholesale trade and transportation sectors. Transportation wages decreased in real value by nearly half between 1988 and 1989 from $639,332 to $297,813. Wages paid in the wholesale trade sector decreased by a lesser amount.

Real wages have increased since 1988 in agriculture and fisheries, and the service sector. In the agriculture and fisheries sector, 3rd-quarter wages increased by over 68% between 1988 and 1992 from $980,029 to $1,647,602. In the service sector, wages increased by 20% during that time, from $4,475,834 in 1988 to $5,353,184 in 1992.

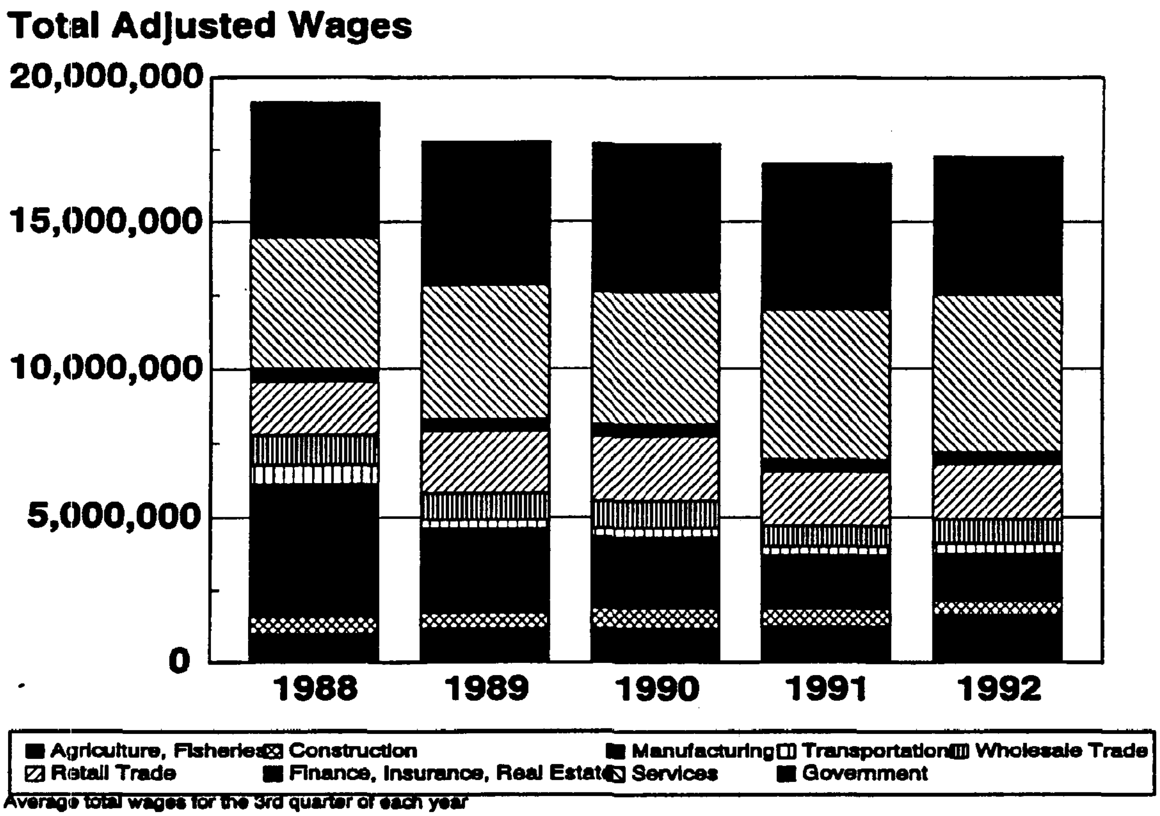

Figure 7. Total Wages by Sector, in 1992 Dollars, Northampton County, VA, 1988 - 1992.

Table 4. Total Wages by Sector, in 1992 Dollars, Northampton County, VA, 1988 - 1992.

Sector	1988	1989	1990	1991	1992
Agriculture, Fisheries	980,029	1,157,807	1,168,694	1,255,856	1,647,602
Construction	613,466	590,872	708,246	598,956	481,867
Manufacturing	4,536,027	2,868,974	2,453,376	1,831,594	1,608,346
Transportation	639,332	297,813	301,262	321,713	375,263
Wholesale Trade	1,012,162	890,923	922,331	701,194	837,009
Retail Trade	1,830,673	2,114,184	2,171,589	1,849,207	1,833,224
Finance, Insurance, Real Estate	419,223	377,000	391,790	372,640	401,601
Services	4,475,834	4,570,377	4,503,899	5,116,352	5,353,184
Government	4,628,278	4,904,824	5,108,521	4,978,534	4,768,829
Total	19,135,024	17,772,775	17,729,708	17,026,047	17,306,925

Source: Virginia Employment Commission, 1993.

Economic Linkages and Leakages

The economic importance of an industry is described in terms of its total industrial output, final demand, income, value added, and total employment. Total industrial output is the dollar value of goods and services produced to satisfy inter-industry input final demands. Final demand is the dollar value of purchases from producing industries for final consumption. Income is the amount paid in wages and to property owners from rent. Value added is equivalent to gross regional product (payments to labor and capital, and taxes), or the value of total industrial output less input purchases. Thus, value added is always less than total industrial output, but greater than income.

An input-output model describing the economic structure of Northampton County was formulated to measure current and potential sectoral economic impacts of sustainable industries. The input-output model is expressed as:

$$X = AX + F$$

where:

- X is total sectoral outputs,
- A is a technical coefficient,
- AX is interindustry demand, and
- F is final demands (goods and services purchased for final consumption by households, governments and/or for export).

The sectors which characterize X are presented in Tables 2,3, and 4 as well as 1992 base year information pertaining to wages and employment. Solving for X yields the following supply and demand balance equation, by which total economic effects can be measured on a sector by sector basis:

$$X = (I-A)^{-1}F,$$

where I is an $n \times n$ identity matrix. In general, a change in the final demand (F) for an existing or newly established sector's output is expected to exert direct, indirect, and induced effects on the local economy, in terms of total output (X), personal income, and total employment. The direct effect of a one dollar change in final demand is that one dollar of initial spending. The indirect effect is of the output of other local businesses needed to support the production of sector *i*, while the induced effect is the impact of spending by households. Total economic effects of a change in final demand (direct, indirect, and induced) for a sector's output is determined by calculating input-output multipliers.

Table 4 lists multipliers for output, total income, value added, and employment, and 1992 base year output levels for an aggregated list of industries in Northampton County. These multipliers are used to assess the regional economic contribution of a given industry at the margin. For instance, if the demand for agricultural crop products increases by $1, then the value of total output generated throughout the region would rise by $1.56 ($1 produced by the crop producing sector and $0.56 produced by all other sectors) to satisfy the one dollar increase in final demand for crop products. If final demand for crop products sector increases by $1, then the amount of additional income generated throughout the local economy would be $0.32. And, if final demand for crop products increases by $1 million, then 20 new jobs would be created locally. The magnitude of these multipliers can also be used to assess the strength of economic linkages between sectors of the local economy. Based on the output multiplier, the retail trade industry, particularly hotels and lodging places, is strongly linked with other industries in Northampton County, the agricultural sector is moderately linked, and the construction industry is weakly linked. Service industries account for a relatively large share of regional output, and changes in their final demands will result in significant economic impacts in the region.

Table 4. Input-Output Multipliers for Northampton County, VA, 1990 Base Year.

Sector	Industry Output ($ of IO per $1 FD)	Total Income ($ of income per $1 FD)	Value Added ($ of VA per $1 FD)	Employment (# of jobs per $1 million FD)
LIVESTOCK*	1.40	0.42	0.49	24.03
CROPS	1.56	0.32	0.36	20.43
Commercial Fishing	1.41	0.46	0.51	32.58
MANUFACTURING	1.30	0.70	0.74	21.54
CONSTRUCTION	1.37	0.50	0.54	23.43
FOOD PROCESSING	1.54	0.32	0.36	20.66
Boat Building & Repair	1.29	0.71	0.74	21.68
TRANSPORTATION	1.50	0.81	0.89	31.73
COMMUNICATIONS	1.30	0.78	0.85	15.03
UTILITIES	1.19	0.54	0.62	6.82
WHOLESALE & RETAIL TRADE	1.73	1.00	1.27	62.43
FINANCE	1.36	0.72	0.77	24.27
INSURANCE	1.72	0.92	1.06	34.85
REAL ESTATE	1.19	0.65	0.87	6.00
Hotels & Lodging Places	1.81	0.94	1.15	62.32
MEDICAL SERVICES	1.63	1.05	1.12	50.40
EDUCATION	1.88	1.06	1.15	67.19
OTHER SERVICES	1.58	0.81	0.88	40.89
MISCELLANEOUS	1.59	-0.94	-0.85	44.41
GOVERNMENT	1.66	1.30	1.38	58.41
Household Industry	3.69	2.48	2.79	248.04

**Sectors indicated by capital letters are aggregated.*

The IMPLAN input-output model uses these multipliers to estimate total economic impacts on an annual basis (industry by industry), in 1990 dollars. Based on the structural characteristics of the local economy, the model determines how many new jobs will be created, and how much additional sectoral output will be necessary economy-wide to accommodate the creation or expansion of an industry. New economic activities usually involve changes in final demand for several industries. Depending on the change considered and expenditure patterns of the population, economic impacts may operate on several multipliers and may be positive or negative.

The input-output multipliers describe and quantify the linkages between economic sectors. The higher the value of the multiplier, the greater the interdependence between that sector and the entire economy. High multipliers signify strong economic linkages, and low multipliers weak linkages. Weak linkages are indicative of *leakages* in the economy. In other words, sales and income are leaving the county.

Another way of measuring leakages in the economy is to estimate *Regional Purchase Coefficients* (RPCs) for each commodity. An RPC is a unique value calculated for each commodity based on the population and land area in the region, and regional employee compensation and employment figures. A commodity's RPC represent the proportion of locally produced good or service that is used to meet local demand. RPCs can take on a value between 0 and 1. An RPC value of 1 means that all units of a commodity purchased locally are produced locally. The lower the RPC, the greater is the leakage in that sector. Table 5 lists selected goods and services produced in Northampton County with low RPC values. These indicate where leakages in the economy are occurring that are significant to the sustainable development activities under study.

Table 5. Regional Purchase Coefficients (RPCs) for Selected Commodities, Northampton County, VA.

Commodity	RPC	Commodity	RPC
Boat building & repair	0.0021	Wholesale trade	0.3711
General merchandise stores	0.1942	Commercial photography	0.0013
Apparel & accessory stores	0.1491	Equipment rental & leasing	0.2030
Furniture & home furnishings	0.1744	Car repair & services	0.4195
Banking	0.3139	Misc. repair shops	0.5490
Credit agencies	0.3944	Amusement & rec. services	0.0755
Beauty and barber shops	0.1191	Legal services	0.4017
Misc. personal services	0.1676	Other educational services	0.1460
Advertising	0.1656	Accounting, & bookkeeping	0.4188

Commodities for which RPC values are relatively high in Northampton County include miscellaneous crops (.9082), landscape and horticultural services (0.7949), new construction (0.8947 for new industrial and commercial construction), hotels and lodging places (0.9504), and eating and drinking places (07976). One aspect of economic development that is often overlooked by supporters of one type of industry or another, is the economic boost that a region can gain by simply "plugging leaks." The fewer the leaks in the existing economy, the greater will be the net impact of a new industry introduced into the region. As a local economy grows and diversifies, more of the dollars generated by each sector will be retained and recirculated within the region. The net impact is positive and ever increasing.

Economic Impact Analysis

Economic impact analyses estimate the effects of independently changing economic activities on economic indicators such as employment, industrial output, income, contribution to the gross domestic product, etc. Regional economic impact analyses provide such information within a geographic area such as a county or group of counties, or of a state. Input/Output (I-O) analyses are widely used in the conduct of regional economic analysis.

An I-O model describes the flows of transactions, in dollars, between the various producing sectors in a region and also across the regional boundary, thus specifying the economic interrelationships between industries (or sectors) and the fact that a change in any industry will have ripple effects throughout the entire regional economic system. The total economic impact of an industry (or sector) on a regional economy consists of direct, indirect and induced impacts. When the demand for the output of any sector increases, it must purchase inputs which produces an indirect impact on the input-supply industries. Both the direct and indirect impacts influence the flow of dollars to the community's households. As a result of the direct and indirect impacts, households earn more income and increase consumption accordingly. The effect of the increased household consumption upon businesses in a community is referred to as an induced impact. The sum of these direct, indirect, and induced impacts is referred to as the multiplier for a given industry.

In the case of tourism for example, the primary sectors are the hotels, restaurants, and recreational services. These businesses purchase inputs from suppliers of many products and thus sectors. Accordingly, in order to analyze tourism an activity description is created. This activity description describes the fractions of total expenditures by tourists that go to the various commodity sectors and that which goes to trade margins. The activity description is then associated with a level of expenditures and the regional input/output model for the region being studied (Northampton County in this example) to construct the scenario and to perform the impact analysis. The regional model for this analysis is constructed using the IMPLAN input/output software.

The economic impacts of tourism extend throughout the County and beyond according to where commodities for retail sale are purchased. In studying the economic impacts of tourism or any of the other scenarios, the magnitude of the impacts will differ greatly depending on whether we define the region of analysis as the County alone, or the entire Eastern Shore region, or the state. Generally speaking, as the region analyzed gets wider, the impacts get larger since flows that would otherwise be "leakages" become internalized as "linkages". Leakages are the dissipation of economic activity due to the payment of wages to in-commuters, and purchases of other inputs and consumer goods from industries outside the region of analysis. As the region analyzed gets wider, however, more of these commuters and industries become part of the region, thus reducing leakage and increasing linkages.

Again, we chose to demonstrate our analysis with the tourist sector. The base tourism expenditure patterns are listed in Table 18. The typical tourist spends money on lodging in hotels and campgrounds, food on and off the vendors premises, gas and oil, auto rental, parts and repairs, and various other goods and services. Each of these activities involves purchases from a different sector, sometimes through a retail outlet and sometimes direct from the producing sector (most services for example). These activity descriptions are organized into a scenario called BASEREC. The scenario refers to one visitor day. By scaling the scenario up to reflect the expected number of visitor days the scenario is complete. The impact procedure is initiated and the IMPLAN model calculates the impacts. These results are then used along with information about the direct impacts to estimate changes in the demand for local public services and in local government revenues projected over time.

Fiscal Impact Analysis

A fiscal impact model highlights the direct and indirect fiscal relationships between industry and government revenues and services. The purpose of fiscal impact analysis is to compare project-induced increases in the demand for (and thus expenditures on) local public services and the increase in local government revenues. Direct fiscal relationships include real property, personal property, and sales taxes paid by the industry, and expenditures by the county governments on infrastructure and public services required by the industry. Indirect fiscal relationships include new expenditures on education and other public services and new taxes paid by employees and other sectors. To analyze the fiscal impacts of the various scenarios considered, the Virginia Impact Projection (VIP) Model was used. The VIP Model has different versions for counties and cities and is calibrated with specific economic, fiscal, social and demographic data for each jurisdiction. The first step in using the VIP Model is calculation of a "baseline" for the locality which predicts future fiscal and economic conditions based on extrapolation of current conditions. This baseline is then stored for comparison with the conditions predicted under the alternate scenarios being studied. The impacts of alternate scenarios are predicted by running the model with the economic changes predicted by the input-output model.

Regional economic and fiscal impacts are linked through their mutual "dependence" on regional employment and income data. As such there are linkages between the data and results of the IMPLAN input-output and VIP fiscal impact models. In the case of tourism, the predicted annual employment and personal income generated by tourists are entered as direct changes in the VIP model. The VIP model generates two measures of fiscal impacts. The "cash flow" measure indicates the expected improvement in revenues relative to expenditures. "Net Public Service Benefits" is a measure of the net benefits that citizens of Northampton County can expect in terms of public services and/or lower taxes as a result of tourism. The public service benefits can be negative or positive and are in addition to employment, income, and other economic benefits. More elaborate explanation of these terms are given in the appendix.

3. ENVIRONMENTAL IMPLICATIONS OF SUSTAINABLE DEVELOPMENT

Traditionally, benefits of economic growth have been reported in terms of employment and income generated, and property taxes paid to the local government. However, today there is increased interest in incorporating information about the level of environmental effects that accompany growth and development.

Incorporation of such effects, including both environmental damage and enhancement, provides information that is useful in at least three ways. First, employment, income and other economic measures are revised to include estimates of environmental damages and enhancements that occur with development of economic activities. Such "green" accounting provides better estimates of net social welfare than do current accounting procedures that ignore depletion and use of natural resources and the degradation of environmental amenities. Second, strategic benefit-cost analyses of a wide range of policy alternatives allows for the development of a package of local policies that set the general agenda for enhancing economic well-being in an environmentally sound manner. Third, project-level, site-specific assessment of benefits and costs allows comparisons of specific projects on both environmental and economic grounds. Decisions using these three types of analyses form the basis for movements toward more sustainable, environmentally sound economic development.

At a minimum, the process of evaluating environmental costs and benefits helps a local community in at least three ways: (1) it helps them define and balance their own economic and environmental priorities; (2) it helps stimulate the development and implementation of site-specific technology that potentially can improve efficiency of resource use and reduced environmental degradation; and (3) it sets the stage for development of institutional responses that provides incentive for adoption and implementation of the improved technology by local public and private resource users.

Trade-offs between Income/Jobs and Environmental Degradation

Conservation assets such as habitat provided by fields and forests, groundwater, estuaries and streams, and economic assets such as stores, machines and equipment are productive capital that provides for a flow of goods and services over time. Yet, private or public investment in conservation assets seldom receives the priority and attention as does investment in economic assets. This occurs for several reasons. First, the system of local income and employment accounts ignores costs of using conservation assets or destroying their capacity to produce. On the other hand, economic assets are fully costed. Under these circumstances natural assets are underpriced, the income and employment accounts are overstated, and natural assets are used in excess. Second, there is no incentive to make investments that maintain the quality of their stock and productive capacity declines.

In addition, individuals often have little incentive to conserve natural assets. First, returns to investments such as soil and water conservation on their land may occur over too long a planning horizon to "pay off" for the individual. Second, costs of overuse, that lead to environmental degradation, often are not considered because they occur offsite. Examples include sedimentation of lakes and streams, and nutrient and chemical contamination of estuaries and groundwater. In this case, other persons or the general public bear the costs rather than the person making the decision.

The bottom line is that environmental degradation often occurs with traditional economic development. In fact, it is often assumed that a region cannot have economic development while at the same time preserving or enhancing the quality of the environment. Under this scenario, there is a tradeoff, namely, jobs and income for the quality of the environment. To the extent such a scenario reflects reality, development is not sustainable.

But many regions are finding opportunities for achieving economic growth without degrading the environment. Ecotourism is one example where communities are attempting to capitalize on environmental quality to attract tourists, yet do so in a sustainable, environmentally sound manner. But to accomplish development that preserves the environmental integrity of a community requires: (1) an understanding of the linkage between economics and the environment; (2) identification of environmental, social and cultural effects in addition to the economic effects of development activities; and (3) sound planning to carry it out.

Sustainability

Early in the planning and development process there must be agreement and understanding of the meaning of sustainability. By sustainable economic development we mean

> "development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs".

Thus, sustainability means more than a simple "preservation of natural resources." It allows for and recognizes that substitution possibilities exist between nonrenewable and renewable resources; that overuse of one natural resource can be offset by enhancement or increased efficiency in use of another natural resource; and that investments in natural resources today can yield increased benefits to future generations.

For example, use of nonrenewable resources, such as mining of sand and gravel, may be consistent with sustainability if the depletion enables investments to be made in renewable natural resources such as estuaries that produce oysters, scallops or finfish. More generally, investment in natural resources such as soil and water conservation or improved wastewater treatment can reduce degradation of the environment. By so doing, short or long run net benefits to the community are enhanced.

Indicators of Sustainability

As implied above, indicators of sustainability must encompass environmental, social and cultural effects as well as economic effects. Economic effects primarily will be based upon employment and income generated, or upon other economic characteristics of the growth and development activities being considered. Environmental effects are based upon underlying factors related to the rate at which inputs (resources) are used, or the rate at which waste products are produced.

Evaluating sustainability based upon input use

For use of renewable resources as an input, sustainability depends upon the relationship between harvest rates and regenerative capacity of the natural system that generates them. Sustainability in the use of nonrenewable resources depends upon the relationship between the rate of depletion and the rate at which renewable substitutes are developed through innovation and investment. In this case, it is understood that, if nonrenewable resources are used (the stock diminishes), sustainability requires that the economic returns generated by that use be invested rather than consumed such that productivity is enhanced sufficiently to offset the loss of nonrenewable resources.

Evaluating sustainability based upon production of output

Waste products are an output of commerce and industry along with production of goods for sale to consumers. Production and sale of products gives rise to employment and income opportunities, but required disposal of associated waste products is costly and can have a negative environmental impact. Indicators of sustainability related to waste production are a function of the amount and characteristics of the waste products of the economic activity relative to the assimilative capacity of the environment in which they are disposed. If degradation of the environment occurs, or the future waste absorptive capacity of the natural resource declines, and this negative impact is not offset elsewhere, then the activity is not sustainable.

Measuring sustainability

There is no single best measure of sustainability for all geographical areas. Many alternative economic, social, cultural and environmental or ecological indicators could be chosen depending upon resources available and resource limitations locally, the economic activities being considered and local preferences. Close involvement of local citizens and officials insures the relevance of the indicator to the region. In general, it is more feasible to work with a small number of indicators than a large number.

These measures can be highly specific, such as concentration of nitrates in groundwater, or more general, such as depletion of groundwater, loss of wildlife habitat, quantity of wastewater discharged in comparison to the assimilative capacity of the receiving land or water body and and amount of solid waste generated.

Economic indicators of sustainability can be based upon income and employment expected to be generated, or upon characteristics of that income and employment. For example, studies have identified the following three indicators of sustainability based upon output: (a) job creation and income generation. This refers to the magnitude of employment and income expected to be generated by the economic activity. Generally, more is preferred to less; (b) local income and employment retention. If economic development activity results in increased employment and income, and most of that impact occurs inside the region, then the activity is more sustainable than one where the impacts occur more heavily outside the region. This is referred to as the amount of "leakage" that occurs in the local economy. The extent or degree of leakage is dependent upon the particular economic activity being considered, the resource endowments of the area, and the characteristics of the local economy; and (c) business diversity. Economies with greater diversity are more sustainable over time than economies that are heavily dependent upon a small number of industries or industry sectors because they are less exposed to fluctuations of the overall economy. Measures of industry concentration can be developed.

Ecosystem Threats in Northampton County

Threats, Stressors and Sources

The Nature Conservancy has developed procedures for conducting a "threats" analysis whereby the most important threats are identified for attention. The process involves identifying: (1) the major ecosystem(s) being evaluated; (2) the major stresses in each ecosystem; and (3) the cause of the stress. Different ecosystems are identified because they differ in characteristics but can individually be defined homogeneously, they respond differently to categories of stress common to the region, and, because of their location, may face different causes of stress, even if the stress itself is the same (e.g. nutrients might be causing stress in two ecosystem, but the sources could be agriculture in one case and residential development in the other).

Ecosystems, Stresses and Threats in Northampton County

For the Virginia Eastern Shore, the Nature Conservancy identifies five ecosystems and the main stresses and threats being faced in each (Tables 6,7). The most detailed discussion is for "The Coastal Estuarine/Lagoon System," with six stresses and six causes of stress being identified. Development of a sustainability indicator for an economic activity will require additional information for most of the ecosystems, although the discussion of stresses is fairly complete.

The system of sustainability indicators for each of these ecosystems would incorporate, at a minimum, economic and environmental components for each economic activity being evaluated. The indicators would be tailored to each ecosystem, to allow stresses and causes to vary from area to area in the county. Thus, an economic activity may have different indicator values depending on the ecosystem it would impact (which usually would depend on the ecosystem in which it would be located).

The economic activities being considered as possible sustainable activities in Northampton county include: (1) nature/heritage tourism; (2) fishery production; (3) agriculture; (4) arts and crafts; and (5) research and education. Sustainability indicators (with environmental and economic components) would be estimated for each.

The economic indicator components are discussed elsewhere in this study, and include estimates of value added and employment for each of the five "sustainable" economic activities. Various measures of value added and employment could be incorporated, such as contribution to diversity of the local economy, retained income, local employment, etc. The exact form of the indicator would need to be determined locally. Based upon the stresses and threats for the particular ecosystem that would be affected by the activity, the key environmental indicator components are next specified. For example, for the Coastal Estuarine/Lagoon Ecosystem three environmental indicators might be nutrient enrichment by nitrogen and phosphorus, and soil sedimentation. These would be used to evaluate all the economic activities within that ecosystem. The final step is to estimate qualitatively or quantitatively the impacts of the activity on the environmental indicators for that ecosystem so that the overall economic-environmental indicator can be evaluated. The same procedure would then be followed for all relevant economic activities and ecosystems. We have then for the Coastal Estuarine/Lagoon Ecosystem the following sustainability components:

Indicator Component	Type
1. Income	Economic
2. Employment	Economic
3. Nutrient enrichment-nitrogen	Environmental
4. Nutrient enrichment-phosphorus	Environmental
5. Soil sedimentation	Environmental

Figures 8 and 9 show examples of how these indicators might be displayed for two hypothetical economic activities developed in the Coastal Estuarine/Lagoon Ecosystem. Estimation of the indicators would be plotted for all five economic activities, and their effects upon the five components compared.

In the Terrestrial Mainland Ecosystem, there might be two environmental indicators: habitat destruction and conversion, and groundwater depletion. Measures of these indicators would have to be developed, but examples could be habitat acreage lost with development of the activity, and groundwater use in millions of gallons per day. The economic indicator components would again be income and employment. In summary, for the Terrestrial Mainland Ecosystem:

Indicator Component	Type
1. Income	Economic
2. Employment	Economic
3. Habitat destruction	Environmental
4. Groundwater depletion	Environmental

Figure 10 shows an example of how the indicators might be displayed for a hypothetical economic activity. Estimation of the indicators would be plotted for all five economic activities, and their effects upon the four components compared.

Summary: Sustainable Development Indicators

The sustainability of Northampton county's five alternative economic development activities requires evaluations related to both economic and environmental characteristics of those activities. An outline of a system for estimating such a sustainable development indicator was presented based upon the five ecosystems for the Eastern Shore, and their most important stresses, each as identified by the Nature Conservancy. Because the stresses in each ecosystem vary, the set of components in the indicator also will vary between ecosystems.

Within each ecosystem, all economic activities being evaluated will be compared using the same sustainability indicator components. This allows an evaluation of economic activities according to the actual ecological stresses that exist in that area and provides a more realistic assessment of sustainability.

It should be remembered that several decisions must be made during actual construction of the sustainability indicators. These include the set of stresses to be included in the indicator for each ecosystem, how each will be measured, the characterization of the economic activities that are being evaluated, and the methods for making qualitative or quantitative assessments of each economic activity with respect to the set of components of the indicator.

The process will be a learning exercise, with later generation models an improvement upon the initial model. However, from the outset, it is expected that the development and analysis of sustainability indicators for Northampton County will provide new insights into the relevance of both economics and environmental characteristics of development activities, the existence of trade-offs between the two, and the importance of planning and policy decisions that will provide incentives and/or guide development and thereby determine many of the environmental effects that go into the components of the sustainable development indicators.

Table 6. Ecosystems, Stresses and Threats in the Virginia Eastern Shore

A. The Atlantic Marine System

1. Stresses
    a. Nutrient enrichment
    b. Sediments
    c. Contaminants
    d. Large-scale petroleum inputs
    e. Depletion of forage fish
    f. Marine debris
2. Threats (sources)

B. The Coastal Barrier Islands

1. Stresses
    a. Destruction of habitats
    b. Disturbance of beach and dunes
    c. Impeded barrier island migration
    d. Invasive plant species
    e. Disturbance of wetlands/alteration of water regimes
    f. Sea level rise
2. Threats

C. The Coastal Estuarine/Lagoon System

1. Stresses
    a. Nutrient enrichment (nitrogen, phosphorus)
    b. Sedimentation
    c. Contaminants
    d. Large-scale petroleum inputs (oil spills)
    e. Destruction of salt marshes
    f. Stratospheric ozone depletion
2. Threats
    a. Human wastewater, agricultural runoff, animal wastes, acid deposition (nutrients)
    b. Development, agriculture (sediment)
    c. Industrial and municipal point source discharge, nonpoint discharge (urban stormwater, atmospheric deposition, agriculture, groundwater contaminants)
    d. Oil spills from offshore oil development or ship collisions or groundings (large-scale petroleum inputs)
    e. Development (destruction of salt marshes)
    f. CFCs and related compounds(stratospheric ozone depletion)

D. The Terrestrial Mainland System

1. Stresses
    a. Habitat destruction and conversion
    b. Groundwater depletion
2. Threats

E. The Chesapeake Bay Shoreline & Nearshore Estuarine System

1. Stresses
    (same as seaside marine and terrestrial mainland systems)

Table 7. General Threats in the Virginia Eastern Shore

<u>Very high priority</u>

1. High-density mainland development

<u>Medium-to-high priority</u>

1. Agricultural practices
2. Off road vehicles on barrier islands
3. Commercial fishing
4. Barrier island development
5. Island recreational use

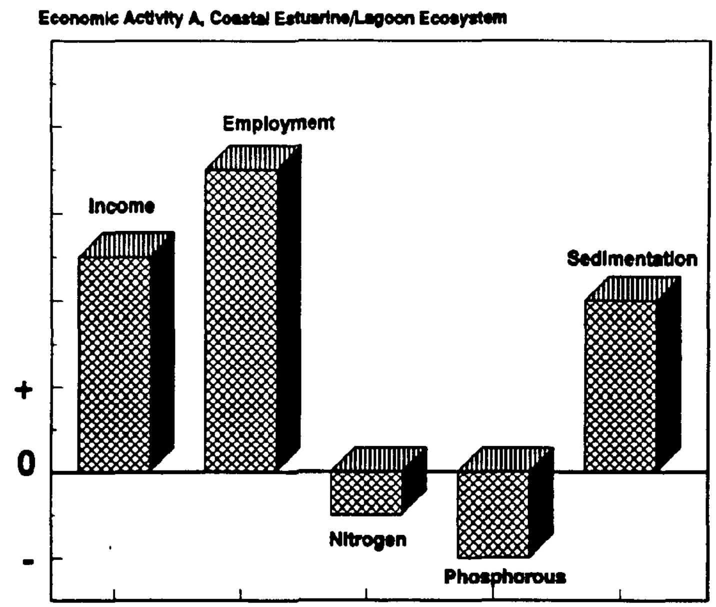

Figure 8. Example of Sustainable Development Indicators for Hypothetical Economic Activity "A" in the Coastal Estuarine/Lagoon Ecosystem, Northampton County, VA.

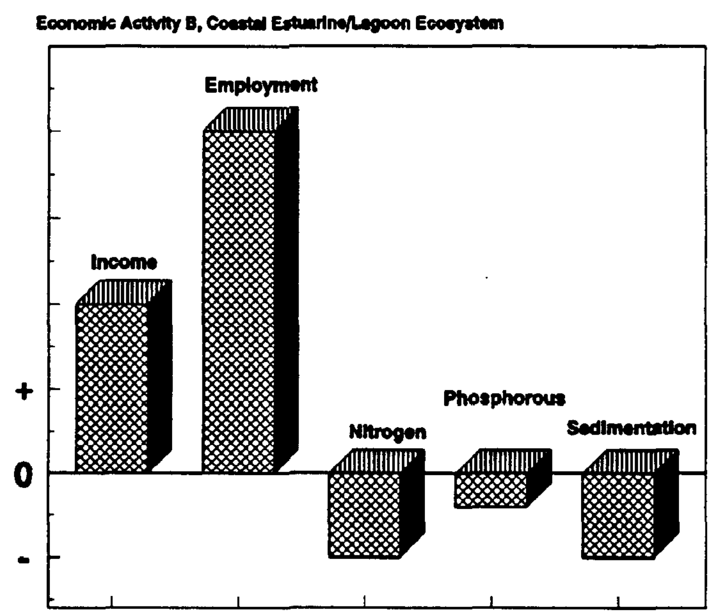

Figure 9. Example of Sustainable Development Indicators for Hypothetical Economic Activity "B" in the Coastal Estuarine/Lagoon Ecosystem, Northampton County, VA.

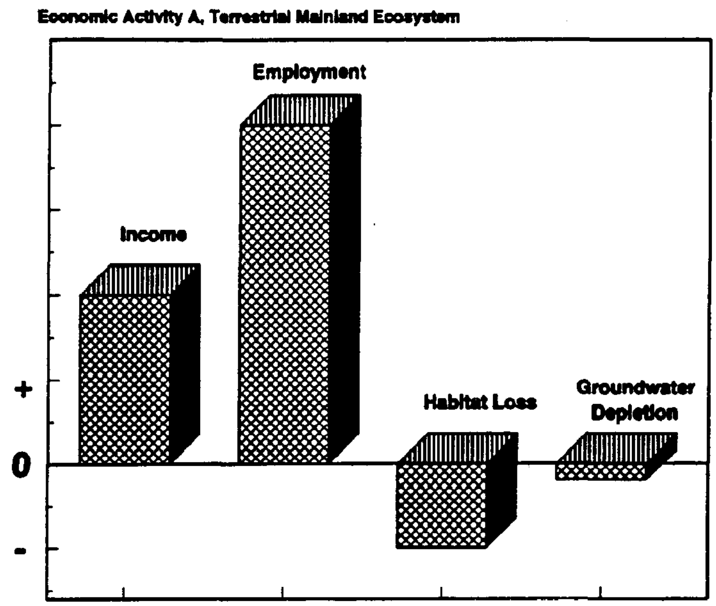

Figure 10. Example of Sustainable Development Indicators for Hypothetical Economic Activity "A" in the Terrestrial Mainland Ecosystem, Northampton County, VA.

4. IMPACTS OF SUSTAINABLE DEVELOPMENT IN NORTHAMPTON COUNTY

Nature/Heritage Tourism

One of the six economic strategies identified in the *Economic Forum* is to develop and promote tourism "activities, attractions and amenities that are compatible with the local environment, Northampton's rural character and its existing natural resource-based industries" (Northampton Economic Forum, p. 13). Nature-base tourism can play a major role in economic development given the quality and variety of natural and heritage resources of the county. Boating and fishing are the most predominant nature-based tourism activities taking place in the county today. However, Northampton can potentially capitalize on its unique wildlife resources and capture a large share of the wildlife viewing and birding market in the metropolitan areas extending from Baltimore south to Virginia Beach. Moreover, Northampton may be in good position to attract other recreation and leisure markets for such activities as long-distance on-road bicycling and heritage tourism.

Current Conditions

The travel and tourism industry has been fairly steady in Northampton County over the past several years. Employment in hotels and motels as reported by the Virginia Employment Commission has remained roughly between 170 and 250 since 1988 with a decreasing trend (Table 8).

Table 8. Employment in the Hotel and Lodging Sector, Northampton County, VA, 1988 - 1992.

Year	Employment*
1988	213
1989	247
1990	211
1991	172
1992	177

* Average employment in the 3rd quarter of each year.
Source: Virginia Employment Commission, 1993.

Revenues from the 2% lodging tax collected in Northampton County show a similar trend between 1989 (the first year the tax was collected) and 1992 (Table 9).

Table 9. Lodging Tax Revenues Collected in Northampton County, VA, 1989 - 1992.

Year	Revenue ($)
1989	39,126.57
1990	45,957.37
1991	43,857.72
1992	43,383.69

Source: Northampton County Treasurer, 1993.

Table 9 shows a slight downward trend in lodging tax revenues between 1990 and 1992. The tax was collected for only part of 1989 and is therefore less than the amounts collected in the succeeding years.

A survey of operators of inns, motels, and campgrounds in the county was undertaken in September, 1993 to collect data on lodging activity during 1992. Survey results indicate a total of 97,215 unit nights were rented in Northampton County in 1992. Most (64,121) unit nights were rented in Cherrystone Campground, a 700-site campground complex on the bayside (see Table 10).

Table 10. Overnight Lodging Facility Unit-Nights Rented, Northampton County, VA, 1992.

Lodging Facility	Unit-Nights Rented
Cape	1,925
Edgewood	713
Rittenhouse	1,363
Sunset Beach	8,494
Holiday	9,700
Peacock	2,097
Anchor	4,509
Bed & Breakfast Inns	1,800
Cherrystone	64,121
Kiptopeke	3,506

Source: Estimated from survey responses by lodging facility operators. Survey administered September, 1993.

Occupancy rate varies considerably between seasons, with summer season reaching a high of 66.5% in July, to a low of 3% in the winter months. (Table 11, Figure 11). Capacity is defined as number of lodging units times available days. Overall, the occupancy rate for lodging facilities in the county is quite low. All units together averaged 23.9% in 1992. Even removing Cherrystone and Kiptopeke campgrounds from the analysis (since camping is highly seasonal), average yearly occupancy at motels and inns remains at 26.8%.

Table 11. Monthly Occupancy, All Lodging Units, Northampton County, VA, 1992.

Month	Units Rented	Capacity	% Occupancy
January	899	34,875	3
February	949	31,500	3
March	1,799	34,875	5
April	4,579	33,750	14
May	9,464	34,875	27
June	13,288	33,750	39
July	23,193	34,875	67
August	20,948	34,875	60
September	9,651	33,750	29
October	5,318	34,875	15
November	1,374	33,750	4
December	1,833	34,875	5
TOTAL	93,295	410,625	23

Source: Estimated from survey responses by lodging facility operators. Survey administered September, 1993.

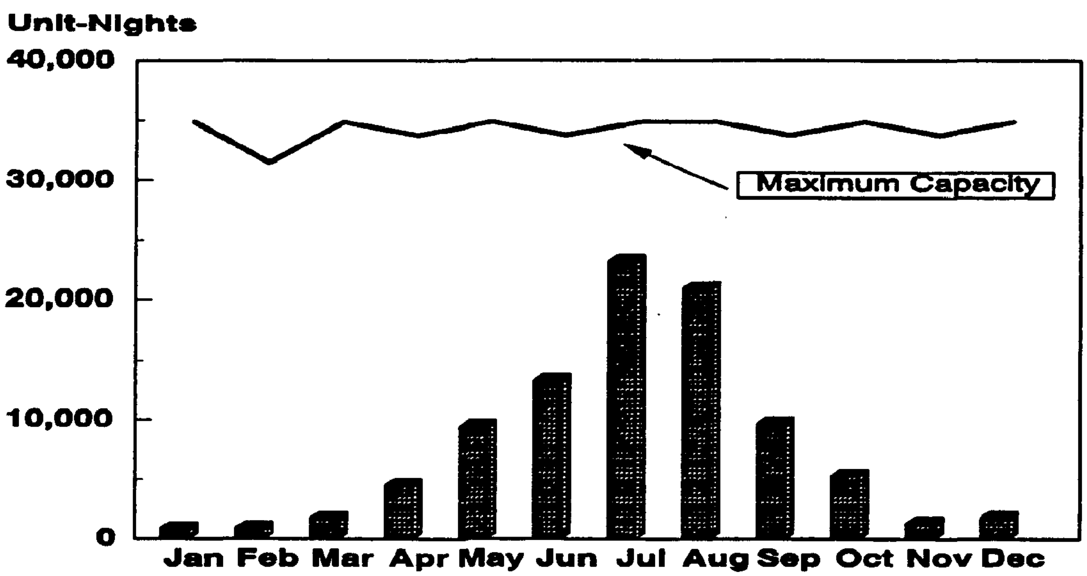

Figure 11. Total Lodging Unit-Nights Rented by Month, Northampton County, VA, 1992

Nationally, a 65% yearly occupancy rate is considered the point at which hotel and motel operations realize a sufficient return to investment (M. V. Brown, 1993). Although lodging units in Northampton County are generally not encumbered with high capital and operating costs that they need to keep their facilities nearly full to stay in business, such low rates do not spur management to undertake facility improvements and upgrades.

The lodging operators surveyed were asked to estimate the average length of stay of their overnight guests. Most visitors staying in motels stayed one night only (Table 12). Overnight visitors staying at Cherrystone Campground were reported to have stayed an average of 8 days.

Table 12. Frequency Distribution of Length of Stay by Type of Overnight Accommodation, Northampton County, VA, 1992.

Length of Stay	Motel/Inn (percent)	Campground (percent)
1 night	71.9	14.4
2 nights	18.8	34.4
3 nights	4.7	4.4
4-6 nights	2.6	3.4
7 nights	1.9	35.8
8 or more nights	0.1	7.8
AVERAGE	1.5 nights	4.3 nights

Source: Estimated from survey responses by lodging facility operators. Survey administered September, 1993.

Estimates of day-visits were made from figures supplied by management staff from Kiptopeke State Park, and marina operators' estimates of boat ramp use. Kiptopeke State Park reported a total of 10,411 day-visitors in 1992, with approximately 27% being from out of the county. From interviews with operators at Cape Charles and Quinby public marinas we used an estimate of 10 users per weekday and 30 users per weekend day at each ramp between March and November (Table 13).

Table 13. Estimate of Launches from Boat Ramps, Northampton County, VA, March 1992 through November 1992.

Ramp Location	Launches per Weekday	Launches per Weekend	Total Use
Cape Charles Harbor	10	30	3,300
Kiptopeke State Park	5	28	2,430
Morely's Wharf Boat Ramp	10	30	3,300
Oyster Boat Ramp	10	30	3,300
Red Bank Boat Ramp	10	30	3,300
West, J.H.	10	30	3,300
TOTAL			18,930

Source: Estimated from survey responses by marina facility operators. Survey administered September, 1993.

The Eastern Shore Wildlife Refuge reported a total visitor count of 12,268 between November 1, 1992 and September 1, 1993. According to managers at the site, most visitors are passing through with a very short visit duration (Alvaez, 1993). The most common activity reported among refuge visitors is wildlife observation along a self-guided trail. Other uses of the refuge include educational tours and organized birding tours.

Bird and deer hunting is a popular activity in the county. in 1992, 2,258 resident, and 141 non-resident hunting permits of all types were sold in the county (Virginia Dept. of Game and Inland Fisheries, 1993). Due to the limitations of this study, the amount of hunting activity in the county is not known. However, to include this group we assumed a combined rate of wildlife observation and hunting equal to the 1993 rate of visitation to the wildlife refuge. Therefore, for the purposes of this study, we estimated a total of 14,000 visitor days spent in wildlife observation and use.

Average party size for overnight visitors also was provided by the lodging operators. Party size averaged 2.0 persons per party at motels and inns, 3.1 persons per party at campgrounds, and 2.2 persons overall. A party size of 3.2 persons, a national standard for persons per motor vehicle, was used for day visitors.

Using the estimates of visit duration and party size, visitor-day figures were converted to party-trips, to control for variations in spending patterns over a single trip. Distribution of party-trips among the overnight accommodations in Northampton County is shown in Table 14, and among day-visit destinations in Table 15.

Table 14. Travel Party-Trips by Lodging Facility, Northampton County, VA, 1992.

Lodging Facility	Party-Trips
Cape	1,336
Edgewood	512
Rittenhouse	874
Sunset Beach	5,801
Holiday	6,623
Peacock	1,375
Anchor	3,048
Bed & Breakfast Inns	1,385
Cherrystone	10,043
Kiptopeke	2,366
TOTAL	33,363

Source: Estimated from survey responses by lodging facility operators. Survey administered September, 1993.

Table 15. Day-Use Party-Trips by Activity and/or Destination, Northampton County, VA, 1992.

Activity/Destination	Party-Trips
Kiptopeke State Park	10,411
Wildlife observation & use	4,375
Boat ramps and docks	22,194
TOTAL	36,980

To estimate activity participation rates, operators were asked to estimate the percentage of their guests whose primary activity was either: (1) visiting nature reserves, birding, wildlife observation and photography; (2) boating and fishing; (3) sightseeing; (4) just passing through; (5) other. These values are reported in Table 16.

Table 16. Tourist Activity Participation by Lodging Facility, Northampton County, VA, 1992.

Lodging Facility	Passing Through		Fishing/Boating		Visiting Reserves Wildlife Obs.		Sightseeing		Other	
	(%)	(No.)	(%)	(No.)	(%)	(No.)	(%)	(No.)	(%)	(No.)
Cape	40	524	47	615	1	39	5	65	7	92
Edgewood	75	377	20	100	1	15	4	20	0	0
Rittenhouse	80	752	10	94	1	28	0	0	9	85
Sunset Beach	89	5,215	4	234	1	176	3	176	3	176
Holiday	89	5,954	4	268	1	201	3	201	3	201
Peacock	40	580	47	680	1	43	5	72	7	101
Anchor	75	2,333	20	622	1	93	0	0	4	124
Cherrystone	0	0	90	8,861	1	295	5	492	4	394
Kiptopeke	10	176	70	1,230	15	791	5	88	0	0
B&B	0	0	5	46	25	692	70	646	0	0
TOTAL		15,909		12,751		2,374		1,761		1,172

Source: Estimated from survey responses by lodging facility operators. Survey administered September, 1993.

Current Economic Impact

The impact of travel and tourism on Northampton County's economy was estimated for 1992. Two fundamental information components are needed to perform an impact estimation: (1) the population of travelers and tourists divided into easily identified, reasonably homogeneous market segments; and (2) spending profiles of each segment.

Most of the systematic variation in spending can be explained by length of stay in the area, party size, lodging type, transportation mode, distance traveled, and primary activities (Stynes and Propst, 1992). Ideally, the tourism market should be segmented by all these variables. Due to the limitations of this study, we were not able to establish a complete set of expenditure profiles by visitor activity. Instead, we segmented the market into 12 segments representing type of lodging (camping, motel/inn, or no lodging), whether they were boaters or not, and resident status (County resident vs. non-resident). In doing so, we aggregated our estimates of all non-boating activities (just passing through, visiting nature reserves, sightseeing, and other) into a single category. Variation in spending due to party size and length of stay can be handled partially by the choice of units of analysis (visitor day, visit, or party trip). Table 17 lists the segments identified in this study, and the distribution of party-trips among them.

Table 16. Party-Trips by Segment Share, Northampton County, VA, 1992.

Segment	Resident	Nonresident
Overnight		
Boating	0	2,660
Not boating	0	18,294
Camping		
Boating	185	9,908
Not boating	79	2,236
Day Use		
Boating	11,592	13,638
Not boating	7,144	4,606
Total	18,999	51,343

In order to get a true picture of visitor spending, one would need to survey a randomly drawn sample of travelers and tourists throughout the year. This was beyond the scope of this study, however. In the absence of a source of primary expenditure data, we used travel and tourism expenditure data gathered from a large sample of visitors to 12 Corps of Engineers projects across the country (Stynes and Propst, 1992). These data were adjusted where values were either known or considered to be inconsistent with circumstances in the county. For example, data on lodging rates in the county have been collected during the course of the study and were used to average lodging expenditures by market segment. These values were substituted for those in the Corps of Engineers study. Also, expenditures on retail clothing and other outlets were adjusted downward, reflecting the lack of many types of retail facilities in the county. Table 17 lists average expenditures by party-trip for each market segment.

Expenditures by market segment were aggregated in proportion to number of party-trips taken by each of the 12 market segments and averaged. The values and categories used in the IMPLAN model are given in Table 18.

Table 17. Average Expenditures per Party-Trip by Market Segment, Northampton County, VA, 1992.

CATEGORY	SEGMENT											
	Residents						Nonresidents					
	Day Boaters	Day Nonboaters	Campers Boaters	Campers Nonboaters	Motel/Inn Boaters	Motel/Inn Nonboaters	Day Boaters	Day Nonboaters	Campers Boaters	Campers Nonboaters	Motel/Inn Boaters	Motel/Inn Nonboaters
hotel/motel	0.00	0.00	0.00	0.00	42.10	42.10	0.00	0.00	0.00	0.00	62.31	62.31
camping fees	0.00	0.00	59.50	59.92	5.75	1.57	0.00	0.00	186.77	186.77	0.00	0.00
grocery	12.91	6.52	58.61	35.63	51.81	24.91	6.47	6.37	41.21	33.80	49.50	13.36
restaurant	2.41	2.37	5.35	5.37	44.55	29.56	3.96	14.12	17.89	15.69	46.09	39.36
auto gas & oil	9.04	4.39	20.93	13.89	15.23	10.48	6.03	4.52	22.15	22.60	25.35	16.63
auto rental	0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.42	1.71	0.00
auto repair	0.40	0.11	0.49	2.14	0.00	0.20	0.19	1.45	0.92	4.84	0.91	0.02
tires	1.45	1.04	0.00	9.00	0.00	0.00	0.00	0.00	0.91	2.82	0.23	16.89
auto parts	0.23	0.00	0.93	1.36	0.36	0.00	0.00	0.00	0.78	7.29	0.77	0.03
parking & tolls	0.35	0.17	0.24	0.94	3.92	0.26	0.17	0.18	1.07	0.71	0.47	0.18
boat gas	10.66	0.00	19.48	0.00	31.64	0.00	6.80	0.00	29.45	0.00	41.39	0.00
boat rental	0.32	0.00	1.17	0.00	14.08	0.00	1.79	0.00	3.67	0.00	10.47	0.00
boat repair	5.62	0.00	2.70	0.00	16.99	0.00	0.12	0.00	8.27	0.00	7.24	0.00
boat parts	5.14	0.00	2.00	0.00	5.46	0.00	1.35	0.00	3.70	0.00	4.71	0.00
launch/slip fees	2.59	0.00	1.68	0.00	0.54	0.00	0.00	0.00	1.92	0.00	8.98	0.00
boat fares	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.17	0.00
fish licenses	0.11	0.08	0.10	0.23	0.46	0.00	0.49	0.00	1.62	0.35	2.70	3.98
charter fees	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.60	0.60	0.18
fish bait	1.36	0.73	5.38	1.40	3.52	2.96	0.95	0.14	3.47	1.48	5.77	1.35
hunt licenses	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ammunition	0.35	0.26	0.00	0.00	0.12	0.00	0.00	0.00	0.00	0.00	0.31	7.89
equip rental	0.19	0.75	0.00	0.00	1.21	3.48	0.24	0.00	0.34	0.20	3.46	2.34
guide fees	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.44	1.16	11.55
sport adm.	0.07	0.05	0.00	0.00	0.52	0.26	0.00	0.02	0.12	0.26	0.15	0.06
tourist attract's	0.23	0.34	0.71	0.39	0.31	3.48	0.58	0.32	1.23	5.46	2.65	1.17
recreation adm.	1.43	0.59	0.27	1.60	1.17	3.48	0.00	0.00	1.51	1.82	3.19	2.79
film	0.84	0.83	2.74	1.88	2.25	4.65	0.30	0.26	2.80	1.43	2.38	1.33

Table 17. Continued

CATEGORY	SEGMENT											
	Residents						Nonresidents					
	Day Boaters	Day Nonboaters	Campers Boaters	Campers Nonboaters	Motel/Inn Boaters	Motel/Inn Nonboaters	Day Boaters	Day Nonboaters	Campers Boaters	Campers Nonboaters	Motel/Inn Boaters	Motel/Inn Nonboaters
film developing	0.56	0.54	2.46	1.50	1.88	3.96	0.06	0.20	0.75	0.98	0.81	0.16
souvenirs	0.09	0.39	0.48	0.76	1.90	0.00	0.31	0.04	4.01	3.05	6.34	4.85
footwear	1.13	3.41	2.40	1.42	1.42	0.00	0.00	0.86	0.97	2.69	2.61	0.00
men's clothing	1.60	1.35	2.21	0.48	0.85	0.00	0.17	1.35	2.29	1.70	2.57	0.72
women's clothing	0.80	0.59	1.77	1.04	1.84	3.26	0.00	0.64	1.86	0.97	2.12	0.95
other	3.52	1.72	3.79	9.45	17.58	3.26	0.14	0.61	3.52	1.85	2.61	4.47
W/I Total	63.65	26.29	195.38	148.39	267.43	137.86	30.11	31.10	343.30	298.21	299.74	192.56

Table 18. Average Travel and Tourism Expenditures per Party-Trip and Total Expenditures by Spending Category, Northampton County, VA, 1992.

Spending Category	Average	Total
hotel	18.56	1,305,639
camping	32.47	2,283,972
food on site	17.35	1,220,313
food off-site	16.88	1,187,502
gas & oil	21.43	1,507,713
auto rental/repairs	1.00	70,421
tires	4.98	350,026
auto/RV parts	0.42	29,582
boat rental	5.42	380,947
boat repairs	2.39	168,465
boat parts	1.81	127,524
boat launch/slip	1.04	73,232
boat fares	0.02	1,655
fish bait	1.61	113,368
ammunition	2.15	150,965
spec. & attr. fees	1.03	72,110
recreation fees	1.42	99,576
film purchase	1.18	83,318
film developing	0.39	27,323
footwear	0.92	64,586
men's clothing	1.19	83,649
women's clothing	0.86	60,563
souvenirs	4.94	347,389
fish & hunt licenses	1.50	105,513
TOTAL	139.96	9,915,669

The total (direct, indirect, and induced) impacts of travel and tourism on Northampton County's economy are described below:

- Total Industrial Output (TIO): $14,297,200
- Wage and Property Income: $7,808,000
- Total Value Added: 9,461,900
- Jobs 454
- Contributions to Tax Revenue $51,000
- Net Fiscal Benefit $232,000

The economic impact of travel and tourism results from non-resident and resident recreationists' spending on lodging ($1,305,639 on motels and inns, $2,283,972 on camping), restaurants ($1,220,313), retail groceries (($1,187,502), fuel and oil ($1,507,713), and other goods and services totaling $9.916 million. Economic impacts on each sector are presented in Table 19. In relative terms, the hotel and lodging sector and the aggregate of the wholesale and retail trade sectors realize the largest impact.

The fiscal impacts of the travel and tourism industry on county government indicate a contribution to county revenues of $51,000. The "Net Public Service Benefit" of this industry is $232,000 captured in a combination of the provision of public services spurred by this industry, and a reduction in taxes.

Table 19. Total Economic Impact of Travel and Tourism on the Economy of Northampton County, VA, 1992, (1990 dollars.

Sector	TIO ($,000)	Total Income ($,000)	Total Value Added ($,000)	Employment (No. of Jobs)
LIVESTOCK	15.1	3.4	3.9	0
CROPS	99.8	9.5	10.0	1
Commercial Fishing	20.2	4.8	5.0	0
MANUFACTURING	1,084.9	577.3	597.0	16
CONSTRUCTION	195.8	59.2	59.7	3
FOOD PROCESSING	105.1	10.5	10.7	1
Boat Building & Repair	747.3	411.4	414.1	11
TRANSPORTATION	212.4	115.1	121.3	4
COMMUNICATIONS	205.4	129.4	138.3	2
UTILITIES	308.9	138.0	159.5	1
WHOLESALE & RETAIL TRADE	4,519.7	2,699.1	3,559.7	200
FINANCE	186.0	96.5	99.2	3
INSURANCE	102.0	53.3	61.3	2
REAL ESTATE	1,364.8	783.5	1,062.8	3
Hotels & Lodging Places	3,358.9	1,685.4	2,115.9	144
OTHER SERVICES	580.6	288.6	293.4	15
MEDICAL SERVICES	711.3	501.8	506.3	25
EDUCATION	54.8	32.7	32.7	3
MISCELLANEOUS	87.1	-110.5	-108.2	3
GOVERNMENT	312.0	294.2	294.2	13
Household Industry	25.1	25.1	25.1	5
TOTAL	14,297.2	7,808.3	9,461.9	454

Potential Economic Impacts

Travel and tourism is a rapidly growing industry nationally, and it is likely that Northampton County can capture a share of this market if the proper steps are taken. The county is rich in natural and cultural resources that can easily form a strong base for attracting travelers and tourists from a wide area. One important feature of this richness is the annual migration of birds through the county. For reasons that are not fully understood Northampton County is an important conduit and depot for an exceptionally large number of migrant species, both in terms of variety of species and absolute numbers. The Delmarva Peninsula may act as a funnel for many birds moving south during their Fall migration, concentrating them near the southern tip as they prepare for crossing the mouth of Chesapeake Bay. Another contributing factor to the large bird migration could be the diversity and integrity of most of the county's ecological zones, which in close proximity include high quality examples of coastal barrier island, estuarine marshes, forests, fields and bayside beaches and wetlands.

The importance of this area for both resident and migrating birds has generated much interest among researchers and among recreational birders (or bird watchers). This common denominator between birding and formal research interests could be a viable opportunity for nature-based tourism, in which the observation of ecological resources, natural history studies and interpretation, and similar activities become the primary object of tourism. For instance, one on-going research activity, the long-standing raptor (birds-of-prey) and songbird banding project at Kiptopeke State Park, was made one of the showcase activities of the First Annual Eastern Shore Birding Festival held in October of 1993.

The historical aspects of the county are also significant from a tourism perspective. The county contains the oldest continuous court records of any county in the nation, housed in Eastville. The county has a large number of old structures dating from historic times. The County Comprehensive Plan lists over 180 such structures, each with its own story to tell.

According to the World Travel and Tourism Council, tourism is now the world's largest industry (Wharton Econometric Forecasting Associates, 1991) In the U.S. over $350 billion was generated in 1989 by foreign and domestic tourists traveling in this country, up 6 percent from 1988 (Weaver, 1991). In that same year, U.S. travelers spent $16 billion on domestic trips over 100 miles (Weaver, 1991). A Stanford Research Institute study projected an estimated 8 percent growth in world tourism overall, with 10 to 15 percent growth expected in adventure/cultural tourism, and 25 to 30 percent growth in nature-based tourism (K. Brown, 1993).

This growth is being fueled, in part, by the aging of the baby boom generation. This demographic cohort, born between 1946 and 1964, accounted for 48 percent of all trips in 1987 (Goeldner, 1992). They are typically in their high-income years and like to travel. Other trends that will influence tourism in the years to come are rising education levels, increasing role of women in the household, the rising expectation of quality experiences by travelers, and declining leisure time (K. Brown, 1993). Higher levels of education is the single most significant factor that influences cultural participation, an important factor in the growth of Northampton County's heritage tourism industry. The increasing economic role of women will mean that more families will be likely to engage in a heritage-tourism experience, particularly as an educational experience for children. The rising expectation of quality travel experiences will place significant pressure on the recreation and tourism providers and host communities to improve and maintain tourism infrastructure. Finally, decreases in leisure time will mean more trips closer to home and fewer long vacations to far off places. Northampton County may be able to capitalize on this factor, being within a one-half day's drive from several large urban centers.

Growth in nature-based tourism, also called ecotourism, is moving toward more active pursuit of the nature experience rather than merely sightseeing in a natural setting such as a national park. For example, Americans purchased approximately 90,000 canoes in 1988, a 14 percent increase over purchases in 1985 (Ingrassia, 1989). The U.S. Travel Data Center determined that nearly seven percent of U.S. travelers, or eight million Americans, report having taken an "eco-trip" (M. Brown, 1993).

Observing wildlife is a rapidly growing recreation activity. Over 3.1 million people in Maryland, Virginia, and Pennsylvania reported taking a trip of one mile or more for the primary purpose of observing, feeding, or photographing fish and wildlife (U.S. Fish and Wildlife Service, 1993). Nationally, people who travel to view, feed or photograph wildlife are typically older (60% are 35 and up), have higher incomes (64% have household incomes greater than $35,000), and well educated (56% had attended college). Interest in wildlife viewing should continue to increase over the next decade in areas where urbanization, education, and income levels continue to rise (U.S. Park Service, 1992).

Sport fishing is one of the most popular outdoor recreation activities in the U.S. A steady increase in fishing has been occurring nationwide, from 17.6 percent of the U.S. population in 1955 to 25.4 percent in 1988. The number of anglers doubled in this period and the days spent fishing increased 2½ times. (U.S. Park Service, 1992).

Bicycling is also a market that Northampton might be able to capitalize on. Seaside Road, stretching the length of the county offers excellent road touring opportunities. According to a study of greenway corridor use, the rate of participation in bicycling in the U.S. tripled since the early 1960's (U.S. National Park Service, 1992). The report goes on to say that as of 1988, bicycling has been one of the most popular and rapidly growing outdoor sports in America. Twelve million bicycles were sold in 1987, more than the number of cars sold that same year. There are several large bicycling clubs in the Virginia, Maryland and Washington, D.C. area that specialize in road touring.

To capitalize on its natural and cultural assets, the county should identify its opportunities and strengths related to nature-based and heritage-based tourism, target a particular segment of the tourist population that is most likely to to use these resources, and develop a marketing strategy to attract them and keep them coming back.

The size of the potential nature-based and heritage-based tourism market that Northampton County could attract is unknown at this time. Additional research is required to identify the size and characteristics of the potential market that would be willing to travel to Northampton County for these opportunities. Northampton's market potential is also a function of management actions taken at the county level to attract and maintain visitors. Hence the total potential market is defined by the combination of tourism demand (the number of potential visitors) and the supply of adequate services to attract and accommodate visitors.

With respect to tourism infrastructure, namely motel and inn accommodations, Northampton County has excess capacity. As shown in Figure 11, lodging unit occupancy averaged below 25% in 1992, with a maximum monthly occupancy rate of 67 percent in July. The county can easily accommodate more tourists without first investing in additional lodging establishments.

To understand the potential impacts of an enhanced travel and tourism industry in Northampton County, we developed four tourism growth scenarios. These are:

(1) Doubling the level of boating activities estimated for 1992 while holding other activities constant;
(2) Doubling the level of non-boating activities estimated for 1992 while holding other activities constant;
(3) Increasing the combined yearly motel and inn occupancy rate in the county to 50% and campground occupancy rate to 40%;
(4) Increasing the combined yearly motel and inn occupancy rate in the county to 75%, campground occupancy rate to 40%, and increasing the number of motel and inn units by 25% while maintaining the higher occupancy rate.

The model results are shown in Table 20. Additional tables illustrating the impacts of these alternative scenarios on each economic sector are contained in Appendix 3.

Table 20. Summary of Total Economic Impacts of Alternative Travel and Tourism Scenarios, Northampton County, VA (1990 dollars).

Scenario	TIO ($,000)	Total Income ($,000)	Total Value Added ($,000)	Jobs (No.)	Taxes ($,000)	Net Fiscal Benefits ($,000)
Base Model	14,297.2	7,808.3	9,461.9	454	51	232
1. Double Boating Activity	20,106.6	10,956.1	13,272.7	639	72	326
2. Double Non-Boating Activity	17,213.0	9,395.9	11,399.5	549	62	279
3. Increase Occupancy Rates	21,073.9	11,481.3	13,926.7	673	138	346
4. Add New Lodging Units	28,209.5	15,409.2	18,690.9	899	181	466

The results of the first two scenarios, (1) increasing boating activity by 50%, and (2) increasing non-boating activity by 50%, illustrate the relative economic impacts of participants in each major activity group. Boaters typically spend more money to sustain their recreational activity. In our model, boaters on average spent $168.08 per party trip, while non-boaters spent $149.75 per party trip. This is due in part to the longer visit duration of boating parties. A large proportion of boaters remain in the county for more than 5 days, while most non-boating groups remain in the county for fewer than three. Also, average spending by boaters is higher since boaters incur more costs on such things as fuel and repairs.

Scenario 3, increasing average motel, inn, and campground occupancy has an obvious positive impact on the economy. At a yearly occupancy rate of 50% in motels and inns, and 40% at campgrounds, total industrial output increases by nearly one-third from $14.3 million to$21 million, value added increases by nearly 50% from $9.5 million to $13.9 million, and number of jobs generated in the economy increases by 219. Adding new lodging units (Scenario 5) increases the numbers further still (the associated impacts of constructing the new units is not included in this analysis).

In each of these scenarios, individual sectors of the economy are affected differently depending on spending patterns and linkages (see Tables in Appendix 3). It should be noted here that the boat building and repair sector lags significantly behind other sectors in indirect and induced effects of tourism spending. This indicates a significant leakage in this sector. As county leaders take steps to increase the number of tourists visiting Northampton, they should also investigate ways to enhance this sector and plug the leak.

With proper planning, marketing and management, it is reasonable to assume that any one of these scenarios may occur. Northampton's strong natural and heritage resource base, and an identifiable and reachable market of travelers within a five-hour drive from the county combine to make tourism a potentially strong component of the county's economy.

Research and Education

Current Conditions

The importance of Northampton County and the Eastern Shore for resident and migrating birds has generated much interest among researchers at nearby universities and research institutions. The unique hydrogeology of the Eastern Shore has also generated research activity in the county. In 1992, there were seven research groups active in the county spending over 5,900 research days (Table 21).

Research activity generates income in a community in two ways: (1) establishing a research facility brings jobs, and maintaining the facility involves expenditures of dollars in the community; and (2) visiting researchers spend money on food and accommodations, and make miscellaneous retail purchases. The larger the research facility, and the higher the volume of research traffic, the greater will be the economic impact.

Northampton County is home to the Eastern Shore Wildlife Refuge which generates the greatest number of research days -- days spent by researchers in the county -- over 2,600 days in 1992. Another facility, the Center for Long Term Ecological Research (LTER) generated approximately 1,800 research days in 1992.

Table 21. Estimation of Research Days Spent in Northampton County, VA by Research Group, 1992.

Research Group	Day-trip Rsch-days	Overnight Motel/Inn Rsch-days	Overnight Private Rsch-days	Type of Accom.	Total Rsch-days
Old Dominion Univ.	148	20	358	house (2)	526
Long Term Eco. Rsrch Ctr.			1,795	house	1,795
Va. Tech.			204	refuge	204
Marine & Estuarine Envrio. Studies Ctr.	578				578
Va. Society of Ornithology		28		motel/inn	28
US FWS Wildlife Refuge			2,670	refuge	2,670
SAMP Bird Study			876	house	876
TOTAL	726	48	5,903		6,677

To estimate the economic impact of research on the county, we estimated two economic inputs: (1) expenditures by researchers while in the county; and (2) costs of maintaining a research facility. Since overnight accommodation is the largest in-county expense, we segregated research-days spent in the county by type of overnight accommodation. We then estimated average daily expenditures for each category (Table 22). Also, from an interview with the LTER station manager, we estimated a yearly expense of $100,000 to cover salaries and maintenance for the station. Our estimate of total research expenditures in Northampton County in 1992 was $377,540

Table 22. Total Research Expenditures in Northampton County, VA by Accommodation Category, 1992.

Expense Type	Units	Expenditure per Unit	Total Expenditures
Day-Trip Research	726 days	24.84	18,035.20
Overnight in Motel/Inn Days	48 days	95.45	4,581.59
Overnight in Private Lodging	5,903 days	53.35	314,923.37
Maintenance of Housing Units	4 houses	10,000.00	40,000.00
TOTAL			377,540.15

The total (direct, indirect, and induced) impacts of ecological research in Northampton County are described below:

- Total Industrial Output: $691,200
- Wage and Property Income: $396,200
- Total Value Added: $474,400
- Jobs 25
- Contributions to Tax Revenues: $2,000
- Net Fiscal Benefit $12,000

Economic impacts on each sector are presented in Table 23. Wholesale and retail trade realize the greatest impact.

Table 23. Total Economic Impact of Ecological Research Activities on the Economy of Northampton County, VA, 1992 (1990 dollars).

Sector	TIO ($,000)	Total Income ($,000)	Total Value Added ($,000)	Employment (No. of Jobs)
LIVESTOCK	0.8	0.2	0.2	0
CROPS	5.0	0.6	0.5	0
Commercial Fishing	1.9	0.5	0.5	0
MANUFACTURING	62.8	33.5	34.6	1
CONSTRUCTION	15.2	4.6	4.6	0
FOOD PROCESSING	10.4	1.0	1.1	0
Boat Building & Repair	25.0	13.7	13.8	0
TRANSPORTATION	11.0	6.0	6.3	0
COMMUNICATIONS	8.9	5.6	6.0	0
UTILITIES	14.9	6.6	7.7	0
WHOLESALE & RETAIL TRADE	291.2	173.9	229.4	13
FINANCE	9.7	5.0	5.2	0
INSURANCE	5.7	3.0	3.4	0
REAL ESTATE	85.2	48.9	66.4	0
Hotels & Lodging Places	10.2	5.1	6.4	0
OTHER SERVICES	39.2	19.5	19.8	1
MEDICAL SERVICES	39.8	28.0	28.3	1
EDUCATION	3.1	1.8	1.8	0
MISCELLANEOUS	5.3	-6.7	-6.5	0
GOVERNMENT	9.5	9.0	9.0	0
Household Industry	36.4	36.4	36.4	7
TOTAL	691.2	396.2	474.9	25

Potential Impacts

Old Dominion University, in cooperation with the Nature Conservancy, announced this year its intentions to establish a research facility in Northampton County dedicated to the study of sustainable development. At the time of this writing it was not yet known the size and scope of such a facility, and hence its total affect on the county's economy. If the research facility evolves into a large center sponsored by a consortium of universities and other research concerns, its impact on the community could be substantial. This is especially true if it becomes large enough to employ several people, and provides a large throughput of research days. Much of the impact now felt from research activities in the county is from associated spending by researchers during their stay in the county.

Without some indication of size and scope of the proposed research facility, it is not possible to enumerate its potential affects on the local economy. However, we ran the model again using a ten-fold increase in the number of research days and expenditures on research facility maintenance. As expected, the economic impacts increased proportionately. However, the fiscal impacts increased more than tenfold. If 60,600 research-days were spent in the county, the tax benefit would increase from $2,000 to $19,000, and the net fiscal benefit would increase from $12,000 to $123,000.

The natural resource base which attracts and supports researchers and their activities is the same one that could become a popular site among recreational birders. This common denominator between birding and formal research interests could be a viable opportunity for ecotourism, in which the observation of ecological resources, natural history studies and interpretation, and similar activities become the primary object of tourism.

Arts and Crafts

Current Conditions

Production and sales of indigenous arts and crafts, often referred to as folk art, can add significantly to a rural economy, particularly if the craftspeople in the area are known for their skills. Production and sales of rural folk art is usually organized through craft guilds and cooperatives. Although several craftspeople live and ply their trade in Northampton County, there is little in the way of an organized system for production and distribution of arts and crafts on such a scale as to have a significant economic impact.

According to one knowledgeable source, there are 12 people who derive their sole income from the sale of their art work, and 19 people who support their incomes in a large part from art sales (Miller, 1993). There are:

- 10 "designer craftspeople" whose full income is derived from their art. These include painters, wood carvers, potters, etc.;
- 2 full-time photographers;
- 12 part-time artisans who support their incomes through art sales. These include carvers, spinners, and weavers;
- 5 teacher/artists who supplement their teaching incomes by selling art;
- 2 part-time quilters who produce quilts as fund raisers for churches and other concerns.

Because of the small and scattered nature of this activity, we did not attempt to model the impacts of folk art production on the economy.

Potential Impacts

To understand how a strong and thriving crafts "industry" might affect the county's economy, we investigated successful arts and crafts guilds and cooperatives in other communities to learn what they were doing. One such cooperative, the Watermark Association of Artisans based in North Carolina served as our model. The Watermark cooperative is large association of 750 member-artisans (350 who are actively producing) that produces, markets, and distributes large volumes of hand-made baskets, quilts, decorative wooden items, dolls, wreaths, and other items. The artisans, all rural women, hale from a 15-county region in eastern North Carolina. Women without craft skills are trained through the cooperative's education program. Watermark produces items for wholesale through a catalog outlet, and retail sales at their own storefront.

In 1992, its 15th year in production, Watermark sales totaled $664,000. Nearly all sales, $590,000 were through their wholesale outlet, while $74,000 worth of craft goods were sold in the retail facility (McKecuen, 1993). We used Watermark's sales figures and production line in our model for Northampton County.

This might be an extreme example of what might be possible through the organized production and sales of local arts and crafts. However, of interest in this study is the way the earnings are cycled through Northampton's economy. If a large-scale crafts cooperative is ever launched in the county, it is important to understand how each sector of the economy will benefit.

To model a crafts cooperative we assumed a producer margin of six percent for all goods sold on the wholesale market and a 25 percent margin for goods sold retail. The results of the analysis are presented in Table 24.

The contribution of an expanded arts and crafts sector to the economy of Northampton County is summarized below:

■ Total Industrial Output:	$939,900
■ Wage and Property Income:	$435,700
■ Total Value Added:	$476,400
■ Jobs	19
■ Contributions to Tax Revenues:	$2,000
■ Net Fiscal Benefit	$14,000

Outside of the sectors that produce the crafts goods, and the trade sectors that sell them, the service and real estate sectors gained the most because of their strong linkages with the rest of the economy.

Table 24. The Potential Impacts of an Expanded Arts and Crafts Industry in Northampton County, VA (1990 dollars).

Sector	TIO ($,000)	Total Income ($,000)	Total Value Added ($,000)	Employment (No. of Jobs)
LIVESTOCK	0.6	0.1	0.2	0
CROPS	3.2	0.3	0.3	0
Commercial Fishing	0.3	0.1	0.1	0
MANUFACTURING	6.3	3.3	3.5	0
CONSTRUCTION	7.3	2.2	2.2	0
FOOD PROCESSING	1.2	0.1	0.1	0
Fabricated Textile Products	207.8	84.1	84.6	2
Furniture and Fixtures	148.9	74.6	74.9	1
Stationery Products	54.5	18.4	18.5	1
Pottery Products	199.9	76.1	77.1	6
Boat Building & Repair	0.1	0.0	0.0	0
TRANSPORTATION	20.7	11.2	11.8	0
COMMUNICATIONS	8.9	5.6	6.0	0
UTILITIES	16.2	7.2	8.4	0
WHOLESALE & RETAIL TRADE	120.9	72.2	95.2	5
FINANCE	7.8	4.0	4.1	0
INSURANCE	4.3	2.3	2.6	0
REAL ESTATE	56.7	32.5	44.1	0
Hotels & Lodging Places	6.8	3.4	4.3	0
OTHER SERVICES	22.0	10.9	11.1	1
MEDICAL SERVICES	29.8	21.0	21.2	1
EDUCATION	2.3	1.4	1.4	0
MISCELLANEOUS	3.6	-4.6	-4.5	0
GOVERNMENT	8.5	8.0	8.0	0
Household Industry	1.0	1.0	1.0	0
TOTAL	939.6	435.4	476.2	19

Agriculture

Current Conditions

Excellent overviews of agriculture in Northampton County can be found in the Northampton County Comprehensive Plan: Information and Analysis, and U.S. Soil Conservation Service Soil Surveys for Northampton County. The review here is focused mainly on general trends in agriculture, but some other background information is briefly reviewed as well. Major trends are described in terms of acreage harvested for various types of production. This is done to alleviate significant problems in interpreting changes in number of farms, production figures, sales, etc. Acreage harvested is a simple measure that integrates changes in technology, the use of labor, and other factors that affect production decisions and the overall economic impacts of agriculture.

Northampton County enjoys goods soils and a relatively mild climate tempered by the large bodies of water surrounding it. Much of Northampton County's area lies in extensive estuarine zones that are unsuitable for farming, but a high proportion of uplands in the county are well-drained and fertile. The majority of upland areas in the county are level or gently sloping.

Over half of the county's soils are classified as prime farmland, meaning that they are among the best suited in the region for producing food and fiber. Prime farmland is also relatively unhindered by rocky soils, poor or excessive drainage, inadequate sources of water, excessive slopes, etc., and so they are areas that allow good yields without high inputs of chemicals, labor, water, and other inputs.

Agriculture has throughout the county's long history been a mainstay of the economy, even as agriculture in general has declined around in the state and country as a whole. The amount of cropland harvested in Northampton County has remained between about 36,000 acres and 50,000 acres throughout most of this century. There have been significant fluctuations in these acreage figures (and the data are not entirely consistent over this long period; for instance, definitions used in surveys have changed) but over the long term there has been a remarkable stability in the areal extent of crop-based agriculture. This stability is relatively uncommon in the Eastern U.S.

Northampton County's agriculture in the early part of this century was dominated by potatoes, which covered 33,400 acres or nearly three-fourths of all harvested cropland. Since then the extent of the potato crop has dropped steadily, down to 13,000 acres in 1940, to 9,200 acres in 1964, and to under six thousand acres by 1982.

Vegetables became the dominant agricultural product in the 1930s, 1940s and 1950s. The county's relatively long growing season and good soils have since made it an important producer of vegetable crops. Though in the 1920s vegetable crops were harvested from only 1,300 acres (about 3% of all cropland harvested), this acreage increased to around 26,000 in the 1940s (or about 63-65% of cropland harvested). In more recent decades this acreage has fallen somewhat in response to numerous forces (drop in available labor and increased labor costs, among others). Today, Northampton is one of Virginia's largest producers of commercial vegetables, even though vegetable production as a proportion of cropland harvested has fallen to around one-fourth (8,400 acres) of the county total (36,000 acres).

The main trend in the county's agriculture over the last two decades has been to diversify away from vegetables. Like farmers in many other parts of the Southeastern U.S., Northampton County farmers began to plant soybeans, often double-cropped with small grains such as winter wheat and barley, on a large scale. In the 1960s, soybeans accounted for around 25% of the cropland harvested. Through the 1980s, in contrast, this percentage rose to the 55%-62% range.

Another component of this trend in diversification is the increase in nursery production. Receipts from nursery and greenhouse crops in Northampton County rose from $1.7 million in 1982 to $3.5 million in 1987.

Table 25. Market Value of Agricultural Goods Sold & of Selected Crops Sold.[1]
(thousands of dollars, not adjusted)

Year	Total Value of Agricultural Goods Sold	Potatoes & Sweet-potatoes	Vegetables	Soybeans	Nursery Products
1969	10,794	4,761	4,150	---	---
1974	19,474	7,149	6,417	---	---
1978	24,813	7,753	9,647	---	1,179
1982	22,151	4,981	5,563	5,905	1,702
1987	19,820	5,708	7,253	1,743	3,534

Source: U.S. Department of Agriculture & U.S. Department of Commerce, Bureau of Census.

Agriculture is by far the largest component of the county's economy. With total output exceeding $68 million in 1990, this sector drives the rest of the local economy. The total impacts of agriculture in Northampton County are described below:

- Total Industrial Output: $68,311,200
- Wage and Property Income: $13,941,200
- Total Value Added: $15,979,000
- Jobs 899
- Contributions to Tax Revenues: $218,000
- Net Fiscal Benefit $411,000

Agriculture's effects on the economy are most strongly felt in the trade, real estate, construction, and service sectors (Table 26). Agricultural production spurs demand for wholesale and retail goods by $3.5 million, real estate by $4 million, construction by

[1]these figures are not adjusted for inflation and therefore should only be compared with other categories in the same year. They may not be directly comparable with data from other sources due to data gathering methods. See text for description of general trends.

$1 million, and medical and other services by over $3 million. About 900 jobs are attributable to the direct, indirect, and induced effects of agricultural production.

Table 26. Total Impact of Agriculture on the Economy of Northampton County, VA, 1990.

Sector	TIO ($,000)	Total Income ($,000)	Total Value Added ($,000)	Employment (No. of Jobs)
LIVESTOCK	849.1	193.2	219.2	13
CROPS	51,085.0	4,840.7	5,121.5	512
Commercial Fishing	5.8	1.4	1.4	0
MANUFACTURING	114.1	60.5	62.5	2
CONSTRUCTION	1,072.4	32.4	326.9	15
FOOD PROCESSING	16.6	1.7	1.7	0
Boat Building & Repair	0.1	0.0	0.0	0
TRANSPORTATION	703.0	380.9	401.4	14
COMMUNICATIONS	458.9	289.0	308.9	4
UTILITIES	1,118.4	499.7	577.4	4
WHOLESALE & RETAIL TRADE	3,545.4	2,117.3	2,792.4	157
FINANCE	677.2	351.5	361.3	11
INSURANCE	280.6	146.8	168.8	5
REAL ESTATE	4,008.0	2,301.0	3,121.1	10
Hotels & Lodging Places	415.3	208.4	261.6	18
OTHER SERVICES	1,705.9	848.0	862.2	45
MEDICAL SERVICES	1,408.6	993.7	1,002.5	49
EDUCATION	108.6	64.7	64.7	5
MISCELLANEOUS	171.8	(217.9)	(213.3)	5
GOVERNMENT	516.6	487.1	487.1	22
Household Industry	49.6	49.6	49.6	9
TOTAL	68,311.2	13,941.2	15,979.0	899

Potential Impacts

Agriculture is a "price taking industry." This means that the mix of crops planted and the amounts of each produced is largely dependent on the expected price of the crop at harvest time. As such, to identify agriculture's potential impact on the local economy given some change in final demand would involve considerable speculation on which prices might change and by how much. It is doubtful that the outcome of such an exercise would be of much use. Instead, to look at the potential impacts of agriculture on the economy, we focused on changes in the cost of supplying agricultural products. Specifically, we identified five scenarios where producers switched to low-input, sustainable agricultural practices to produce their usual mix of crops. We then measured the potential economic impact of each scenario on Northampton County. The scenarios are described below:

Scenario 1: 40% Loading Reduction Scenario. This scenario assumes a 40 percent reduction in chemical percolation to groundwater from existing practices .
Scenario 2: Conservation Reserve Program (CRP) Scenario. The CRP is a federal program designed to reduce soil erosion through retirement of highly erodible soils from cropping. It is assumed that Federal payments in the amount of $70 per acre are made to the farmer to retire his land.
Scenario 3: Buffer Strip Scenario. Require that 100 feet on each side of a perennial stream be taken out of cropland production. No financial payments were assumed to be made to the farmer in lieu of production.
Scenario 4: Green Manure Crops. Green manure crops added as winter cover are beneficial for preventing soil loss and absorbing residual chemicals over the winter season. This scenario assumed that a clover/rye mix was used as a winter crop and as a green manure source.
Scenario 5: Chicken Litter. In this scenario, chicken litter is substituted for inorganic nitrogen.

Each of the sustainable agriculture scenarios assumes that 20,000 acres in the county are converted from the current practice to the practice in question. This would constitute just under half of all agricultural acres in the county. In the case of the Buffer Strip scenarios this implies that one half of the farm acreage with streams would be affected. In the Conservation Reserve Program scenario this acreage assumption is somewhat unrealistic. This program is limited to 25 percent of cropped acreage in a county. Since the CRP program is unlikely to be expanded, this scenario is included as an example of what would happen if a similarly structured program were to be offered at the state or local level to retire delicate lands from intensive crop production.

The effects of these sustainable agriculture scenarios on the county's economy are summarized in Table 26.

Table 26. Summary of Total Economic Impacts of Alternative Sustainable Agricultural Practice Scenarios, Northampton County, VA, 1990.

Scenario	TIO ($,000)	Total Income ($,000)	Total Value Added ($,000)	Jobs (No.)	Taxes ($,000)	Net Fiscal Benefits ($,000)
Base	63,311,200	13,941,200	15,979,000	899	218,000	411,000
1. 40% Loading Reduction	68,390,400	14,026,200	16,069,900	922	220,000	411,000
2. CRP	67,200,900	13,338,200	15,285,300	866	216,000	319,000
3. Buffer Strips	68,234,700	13,928,300	15,959,600	896	---	---
4. Green Manure Crops	68,777,600	14,417,100	16,494,100	910	218,000	427,000
5. Chicken Litter	68,403,700	14,034,100	16,080,100	901	---	---

Much of the differences between the scenarios depends on the level of subsidy and/or taxation incorporated into the incentive structures. Chemical Taxation for instance (not included in the full impact analysis) had very harsh economic disincentives and thus would have led to significantly negative economic impacts. For this very reason, it is not an attractive sustainable development strategy.

Increased CRP acreage has a slightly depressing economic impact itself. However, it is important to note that both it and the Buffer Strip scenario are complementary with tourism strategies because they increase wildlife habitats. Estimates for Virginia suggest that the small negative impacts of reduced agricultural output can be more than offset by increases in hunting and other recreational activities.

Another interesting observation is that because the sustainable agriculture strategies often substitute chemical or other inputs with labor, there are discernable distributional effects. Employment is enhanced considerably by the Run-off Reduction scenario while income is only marginally increased. This is because the increased income from the jobs generated by the more labor intensive agriculture are almost offset by the reduced income to farm operators.

Food Processing

Current Conditions

Food processing is so closely tied to agriculture and seafood production in Northampton County, that we included it in our analysis even though it was not initially identified as a sustainable activity. Moreover, changes in activity in this sector have been found to strongly effect output in the seafood and agricultural sectors.

Food processing plants were major employers in the county through 1988. In the 3rd quarter of that year, about 846 county residents were employed in this sector. However, by 1991, years over 500 jobs were lost, nearly 10% percent of the total labor force (Table 27). In the 3rd quarter of 1991 only 257 people were employed in food processing in Northampton County. In the same quarter of 1992 employment in the food processing sector had dropped to 202 jobs.

Table 27. Employment in the Food Processing Sector, Northampton County, VA, 1988 - 1992.

Year	Employment
1988	846
1989	619
1990	531
1991	257
1992	202

Source: Virginia Employment Commission, 1993.

Vegetable and seafood processing still had a significant impact on the county's economy as late as 1990. The total impacts of food processing on Northampton's economy in 1990 are described below. Sectoral impacts are described in Table 28.

- Total Industrial Output: $45,787,600
- Wage and Property Income: $9,549,000
- Total Value Added: $10,706,000
- Jobs 617
- Contributions to Tax Revenues: $92,000
- Net Fiscal Benefit $276,000

Table 28. Total Impact of Vegetable and Seafood Processing on the Economy of Northampton County, VA, 1990.

Sector	TIO ($,000)	Total Income ($,000)	Total Value Added ($,000)	Employment (No. of Jobs)
LIVESTOCK	23.4	5.5	6.3	0
CROPS	1,504.1	142.5	150.8	15
Commercial Fishing	5,127.9	1,221.6	1,258.6	113
MANUFACTURING	20.1	10.5	10.8	0
CONSTRUCTION	283.3	85.6	86.4	4
FOOD PROCESSING	29,739.6	2,956.1	3,038.9	246
Boat Building & Repair	0.3	0.1	0.1	0
TRANSPORTATION	564.0	305.5	322.0	11
COMMUNICATIONS	319.3	201.1	214.9	3
UTILITIES	625.7	279.6	323.0	2
WHOLESALE & RETAIL TRADE	2,679.5	1,600.2	2,110.4	119
FINANCE	283.0	146.9	151.0	4
INSURANCE	169.7	88.8	102.0	3
REAL ESTATE	1,858.4	1,066.9	1,447.2	5
Hotels & Lodging Places	225.8	113.3	142.2	10
OTHER SERVICES	868.0	431.5	438.7	23
MEDICAL SERVICES	967.1	682.2	688.3	34
EDUCATION	74.6	44.4	44.4	3
MISCELLANEOUS	118.8	(150.7)	(147.4)	3
GOVERNMENT	300.3	283.1	283.1	13
Household Industry	34.1	34.1	34.1	6
TOTAL	46,787.6	9,549.0	10,706.0	617

There are many reasons why the food processing industry left Northampton County. With respect to vegetable processing, the chief cause was competition from large processing concerns, especially in California. Vegetable marketing and product development changed substantially in the 1980's as new products took hold requiring strong marketing efforts and alternative distribution networks. Also, processing technology changed, making older facilities obsolete. Retooling to accommodate modern technologies would have involved a large capital investment, a difficult and risky venture in such a rapidly changing market. Moreover, environmental compliance requirements in place at the federal and state levels increased the cost of production at a time when profit margins were already thinning.

Seafood processing was also affected by environmental compliance costs as well as compliance with new food safety regulations imposed by the U.S. Food and Drug Administration. Increasing costs as well as changes in processing technology have led to consolidation into larger plants, some of which are located in the Tidewater area of Virginia. This, tied with reduced catch of most seafood species, has resulted in most seafood processing being done outside of Northampton County.

Potential Impacts

In both the seafood and vegetable processing sectors the chances of development in Northampton County are probably quite limited. The greatest potential in the county is in specialty foods. If Eastern Shore tourism expands, specialty foods with significant added value may be directly marketed to tourists, and possibly wholesale as well through mail-order outlets. Targeting specialty markets would allow for higher production costs that cannot be accommodated in conventionally processed food markets. To market in traditional channels, an option might be for a producer to buy a nationally recognized label, or entice a national brand producer to the area.

We looked at the potential for food processing in the county a little differently however. The scenario we used assumes that the losses of employment in the food processing sector in the last decade (about 750 jobs from the sector's peak to its recent low) are regained. For this to occur the sector would require a major infusion of new technology and capital. While the scenario assumes that the technology and labor intensity would be typical of other firms in the industry, it is much more likely that new entrants into this sector would have much higher output per laborer, and much higher capital per laborer. Furthermore, this scenario would only be possible if the supply of raw material (vegetables and seafood) were available. Given current supply conditions this may not be realistic. The economic impacts of this scenario are given below.

The total potential impacts of regaining 1988 levels of food processing capacity on Northampton's economy (in 1990 dollars) are relatively large. About four times the income would be made in the county under this scenario than what was made in 1990. These impacts are summarized as follows:

- Wage and Property Income: $38,440,000
- Total Value Added: $43,068,000
- Jobs 2,490
- Contributions to Tax Revenues: $1,338,000
- Net Fiscal Benefit $1,278,000

Seafood, Finfish and Shellfish

Current Conditions

The fishery and related industries on the Eastern Shore of Virginia is second only to agriculture in the area in terms of employment and personal income generated. Throughout its history, Northampton County fishermen have harvested vast quantities of fin- and shellfish from the Chesapeake Bay and seaside area of the Eastern Shore peninsula.

Drastic changes have occurred over the past century in the quantity and species of fish and shellfish harvested by Virginia from the Chesapeake Bay and Eastern Shore seaside. Illustrating this point is the case of the oyster fishery. Prior to 1925 Virginia produced 4 - 7 million bushels of oysters annually. Between 1931 and 1960 production decreased to 1.3 - 3.5 million bushels per year, but still Virginia was the foremost producer of oysters on the east coast. In 1959 the serious disease MSX took its toll on the population, and less than 1 million were harvested that year. MSX continues to be a problem all along the Mid-Atlantic coast.

Though some species have declined significantly, the commercial landings for Virginia continue to stay at approximately the same level as in the 1980's. In 1986, over 460 plants involving seafood processing were in operation in the state, ranking Virginia first nationally for such production. Northampton County had 770 full and part time watermen at that time, with 25 seafood businesses in the county. A negative effect was felt with the closing of several major seafood industry plants in 1989. A shortage of sufficient semi-skilled labor has been linked to the lack of growth in this industry on the Shore.

Table 29. Commercial Finfish and Shellfish Landings and Estimated Value for Selected Years, Virginia and Northampton County, VA.

	Virginia		Northampton County	
Year	Pounds Landed	Estimated Value	Pounds Landed	Estimated Value
1973	630,744,000	$40,857,000	41,973,077	$5,211,028
1978	538,310,000	$60,667,000	14,419,387	$5,800,765
1983	750,443,000	$84,538,000	13,280,009	$5,843,365
1988	650,852,000	$104,336,000	20,737,462	$7,746,735
1992	630,521,000	$90,500,000	2,574,629	$1,461,547

Source: Virginia Marine Resources Commission, 1993.

As can be seen from the above table, commercial landings in the county have decreased drastically within the last 20 years. The very large change in landings between 1988 and 1992 is primarily due to the relocation of processing capacity out of the county.

Fluctuations in the actual harvest and the value of that harvest are also dependent on natural variation, climate changes, predators, disease, and destructive acts of man.

According to information contained in the 1989 Comprehensive Plan, Northampton County is home to largest clam aquaculture farm in North America, Cherrystone Aqua Farms. Cherrystone currently produces about 40 million seed clams annually, which they "plant" themselves, sell, or rent out to co-ops around the Shore. They expect to reach a goal of producing 50 million market-size clams annually (Pierson, 1993), valued over 7 million dollars. There are several other smaller clam hatcheries on the shore, including a long history of bay scallop aquaculture research at VIMS in Wachapreague. Hybrid striped bass, catfish, rainbow trout, soft shell crabs, and crawfish are all being farmed currently in the state, a few of which may have potential on the Eastern Shore in Northampton County. The location, climate, and unique estuary features of Northampton County make it well suited for such endeavors.

In 1990 the direct, indirect and induced affects of the seafood industry in Northampton County produced approximately $20.8 million dollars in income and 478 jobs (Table 30). Outside of the commercial fishing sector, most of the impact was centered in wholesale and retail trade. The total economic impacts of seafood production sector on the county in 1990 are summarized below:

- Total Industrial Output: $20,759,700
- Wage and Property Income: $6,804,100
- Total Value Added: $7,558,000
- Jobs 478
- Contributions to Tax Revenues: $49,000
- Net Fiscal Benefit $190,000

Table 30. Total Impact of Seafood Production on the Economy of Northampton County, VA, 1990.

Sector	TIO ($,000)	Total Income ($,000)	Total Value Added ($,000)	Employment (No. of Jobs)
LIVESTOCK	14.7	3.3	3.8	0
CROPS	107.8	10.2	10.8	1
Commercial Fishing	14,690.3	3,499.7	3,605.7	322
MANUFACTURING	12.5	6.6	6.8	0
CONSTRUCTION	190.0	57.4	57.9	3
FOOD PROCESSING	8.9	0.9	0.9	0
Boat Building & Repair	0.7	0.4	0.4	0
TRANSPORTATION	184.2	99.8	105.2	4
COMMUNICATIONS	137.8	86.8	92.8	1
UTILITIES	180.7	80.8	93.3	1
WHOLESALE & RETAIL TRADE	1,486.5	887.7	1,170.8	66
FINANCE	185.7	96.4	99.1	3
INSURANCE	174.8	91.4	105.1	3
REAL ESTATE	1,387.1	796.4	1,080.2	4
Hotels & Lodging Places	202.9	101.8	127.8	9
OTHER SERVICES	691.6	343.8	349.6	18
MEDICAL SERVICES	749.4	528.7	533.4	26
EDUCATION	57.8	34.4	34.4	3
MISCELLANEOUS	91.8	167.7	167.7	7
GOVERNMENT	177.9	167.7	167.7	7
Household Industry	26.4	26.4	26.4	5
TOTALS	20,759.7	6,804.1	7,558.0	478

Potential Impacts

The scenario we used to project potential impacts from an enhanced seafood sector is tied closely to food processing capacity. In this scenario we assume that the demand for seafood rises enough to employ the same 750 employees as in the food processing scenario above, but in an economy other than Northampton. Even though processing occurs elsewhere, our model has Northampton's commercial fishermen supplying their typical share of this expanded market. Thus this scenario assumes the fishing levels that occurred in the food processing scenario without the food processing increase. Again this is possible only if the supply conditions permit. A summary of the economic impacts from this scenario are presented below:

- Wage and Property Income: $14,047,000
- Total Value Added: $4,748,000
- Jobs 987
- Contributions to Tax Revenues: $100,000
- Net Fiscal Benefit $393,000

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APPENDIX 1

DEFINITIONS OF TERMS USED

The multiplier effect refers to the following process: a new firm or activity creates jobs which provide income to previously unemployed and underemployed person, those persons spend much of their income on goods and services bought within the county, this increase in demand for goods and services purchased in the local economy eventually results in the creation of other new jobs in the region (in retail establishments, service industries, suppliers of raw materials to the new company, producers of new products using the new firms output as input, etc.), and the cycle continues with more income being spent, creating increased demand and more new jobs. This effect does eventually end since at each stage some of the newly employed persons' incomes will be used to purchase goods and services outside the region. This loss is known as leakage. Once the value of all new income has leaked out of the County, there is no more driving force behind the multiplier effect, and the cycle ends. The sum of all activity that has occurred during the cycle is the output multiplier.

The multiplier is calculated by distinguishing direct effects from indirect effects and total effects. The direct effects are those associated with the facility itself--its output, employment, and income. The indirect effects are all those effects that occur to other firms in the county and state. The total effects are the sum of the direct and indirect effects. Thus the multiplier is the total effect divided by the direct effect.

Input-output models distinguish between output, income, and gross state product. Output, sometimes called economic activity, includes all sales from all firms. This is the most commonly used measure of impact but is not the best measure because it includes a lot of intermediate products produced in other regions. Gross state product (GSP) is a better measure since it nets out the part of output not produced locally. Income measures the portion of GSP which becomes the gross income of individuals.

Fiscal cash flow refers to the net change in local government revenues and expenditures. It is a very important concern of local governments since it affects their ability to balance the budget. The term net public service benefits, on the other hand, measures the effects of changes in the value of public services and changes in the cost of providing them. Changes in expenditure levels mask a complicated combination of changes in unit costs of service, changes in the quantity of services provided, and changes in the quality of services. Despite the importance of fiscal cash flow projections, it is the net benefit projections which ultimately determine the desirability of a local government alternative. This latter measure, then, is generally the most appropriate bottom line.

Since costs and benefits occur over many years and commonly continue infinitely, it is sometimes desirable to express them in present value terms. The present value of a stream of net benefits is similar to the purchase price of an annuity or the principal of an amortized loan which can be collected or paid for over a given period or even infinitely. The present value is calculated by discounting future values and expressing them in today's equivalents.

APPENDIX 2

THE MODELS EMPLOYED

IMPLAN was used to generate a series of economic multipliers for Northampton. IMPLAN is what is known as an input-output, or intersectoral, model. Industries within an economy are interdependent in the sense that goods and services are traded among firms. An increase in the demand for an existing sector's output, or the location of a new firm in the region will result in increased output in many other sectors of the economy. These additional effects are quantified by calculating input-output multipliers. The IMPLAN system provides the data necessary to construct an input-output model of any county, or grouping of counties, in the country. It provides multipliers for any of the 528 sectors which happen to exist in the region under study. When a new firm is anticipated in a sector for which there are no current firms, the IMPLAN system can be adjusted to include the new firm.

In this study the IMPLAN model was used to estimate multipliers for Northampton County. Since the leakages from the state are much lower that the leakages from the regional economy, the state multipliers are generally higher. The difference between the two multipliers is the economic activity which occurs in other regions of the state.

Local governments in Virginia have had access to the Virginia Impact Projection Models since 1984. The VIP models are based on cross-sectional, time-series econometric analysis of the cities and counties of Virginia. The relationships between public service expenditures, revenues, and various socioeconomic factors were identified and estimated. As the influencing variables in these equations change in response to population growth, changes in employment, etc., per capita expenditures are expected to change according to the statistically estimated relationships. By calculating the expenditure levels projected by these relationships, the impact of various types of economic scenarios are estimated.

APPENDIX 3

IMPACTS BY SECTOR FOR SELECTED DEVELOPMENT SCENARIOS

BOATX2

Double Boating Activities

Sector	TIO ($,000)	Total Income ($,000)	Total Value Added ($,000)	Employment (No. of Jobs)
LIVESTOCK	21.1	4.8	5.5	0
CROPS	140.4	13.3	14.1	1
Commercial Fishing	23.8	5.7	5.8	1
MANUFACTURING	1,546.9	823.2	851.2	22
CONSTRUCTION	279.5	84.4	86.2	4
FOOD PROCESSING	121.4	12.1	12.4	1
Boat Building & Repair	1,011.8	557.1	560.7	15
TRANSPORTATION	291.2	157.8	166.3	6
COMMUNICATIONS	292.6	184.3	196.9	2
UTILITIES	440.9	197.0	227.6	1
WHOLESALE & RETAIL TRADE	6,075.1	3,628.0	4,784.8	269
FINANCE	262.8	136.4	140.2	4
INSURANCE	143.5	75.1	86.3	3
REAL ESTATE	1,922.3	1,103.6	1,496.9	5
Hotels & Lodging Places	5,056.9	2,537.5	3,185.6	217
OTHER SERVICES	819.6	407.4	414.2	22
MEDICAL SERVICES	1,001.3	706.4	712.7	35
EDUCATION	77.2	46.0	46.0	4
MISCELLANEOUIS	122.6	-155.6	-152.3	4
GOVERNMENT	420.4	396.3	396.3	18
Household Industry	35.3	35.3	35.3	6
TOTAL	20,106.6	10,956.1	13,272.7	639

NOTBOATX2

Double Non-Boating Activities

Sector	TIO ($,000)	Total Income ($,000)	Total Value Added ($,000)	Employment (No. of Jobs)
LIVESTOCK	18.2	4.1	4.7	0
CROPS	121.6	11.5	12.2	1
Commercial Fishing	25.9	6.2	6.4	1
MANUFACTURING	1,207.3	642.4	664.3	17
CONSTRUCTION	236.9	71.6	72.2	3
FOOD PROCESSING	135.8	13.6	13.9	1
Boat Building & Repair	856.6	471.6	474.7	12
TRANSPORTATION	255.9	138.6	146.1	5
COMMUNICATIONS	248.7	156.6	167.4	2
UTILITIES	372.1	166.3	192.1	1
WHOLESALE & RETAIL TRADE	5,440.0	3,248.7	4,284.6	241
FINANCE	225.2	116.9	120.1	4
INSURANCE	123.4	64.6	74.2	2
REAL ESTATE	1,652.4	948.6	1,286.7	4
Hotels & Lodging Places	4,143.5	2,079.2	2,610.2	178
OTHER SERVICES	700.3	348.1	354.0	18
MEDICAL SERVICES	861.2	607.5	612.9	30
EDUCATION	66.4	39.6	39.8	3
MISCELLANEOUIS	105.5	-133.8	-131.0	3
GOVERNMENT	385.8	363.7	363.7	16
Household Industry	30.3	30.3	30.3	5
TOTAL	17,213.0	9,395.9	11,399.5	549

DBL OCCUPANCY

Occupancy: Motel/Inn = 50%, Campgrounds = 40%

Sector	TIO ($,000)	Total Income ($,000)	Total Value Added ($,000)	Employment (No. of Jobs)
LIVESTOCK	22.3	5.1	5.7	0
CROPS	148.5	14.1	14.9	1
Commercial Fishing	26.6	6.3	6.5	1
MANUFACTURING	1,513.6	805.5	832.9	22
CONSTRUCTION	293.5	88.7	89.5	4
FOOD PROCESSING	136.7	13.6	14.0	1
Boat Building & Repair	1,010.3	556.2	559.8	15
TRANSPORTATION	305.3	165.4	174.3	6
COMMUNICATIONS	307.8	193.8	207.2	3
UTILITIES	461.6	206.2	238.3	2
WHOLESALE & RETAIL TRADE	6,419.0	3,833.4	5,055.8	284
FINANCE	276.7	143.6	147.6	4
INSURANCE	151.2	79.1	90.9	3
REAL ESTATE	2,025.3	1,162.7	1,577.1	5
Hotels & Lodging Places	5,361.9	2,690.5	3,377.7	230
OTHER SERVICES	863.3	429.1	436.3	23
MEDICAL SERVICES	1,055.1	744.3	750.9	37
EDUCATION	81.3	48.5	48.5	4
MISCELLANEOUS	129.2	-163.9	-160.4	4
GOVERNMENT	447.5	421.9	422.0	19
Household Industry	37.2	37.2	37.2	7
TOTAL	21,073.9	11,481.3	13,926.7	673

NEWUNITS

Occupancy: Motel/Inn = 75%, Campgrounds = 40%; Add 25% New Units

Sector	TIO ($,000)	Total Income ($,000)	Total Value Added ($,000)	Employment (No. of Jobs)
LIVESTOCK	29.8	6.8	7.7	0
CROPS	198.3	18.8	19.9	2
Commercial Fishing	40.9	9.8	10.0	1
MANUFACTURING	1,997.2	1,062.8	1,099.0	29
CONSTRUCTION	387.7	117.1	118.2	5
FOOD PROCESSING	213.3	21.2	21.8	2
Boat Building & Repair	1,443.5	794.7	799.8	21
TRANSPORTATION	416.5	225.7	237.8	8
COMMUNICATIONS	406.7	256.1	273.7	3
UTILITIES	608.7	272.0	314.3	2
WHOLESALE & RETAIL TRADE	8,958.2	5,349.7	7,055.6	396
FINANCE	368.6	191.3	196.6	6
INSURANCE	202.1	105.7	121.6	4
REAL ESTATE	2,705.9	1,563.5	2,107.1	7
Hotels & Lodging Places	6,715.3	3,369.7	4,230.4	288
OTHER SERVICES	1,143.8	568.5	578.0	30
MEDICAL SERVICES	1,410.3	994.9	1,003.8	49
EDUCATION	108.7	64.8	64.8	5
MISCELLANEOUS	172.7	-219.1	-214.5	5
GOVERNMENT	631.6	585.5	595.6	27
Household Industry	49.7	49.7	49.7	9
TOTAL	28,209.5	15,409.2	18,690.9	899

APPENDIX 4

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